Blister Rust

WESTERN BLISTER RUST NEWS LETTER

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WESTERN BLISTER RUST

NEWS LETTER

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U. S. Department of Agriculture
Bureau of Entomology
Division of Plant Disease Eradication and Control
Spokane, Washington

SCOUTING IN CALIFORNIA

Leiton E. Nelson

Because the spread of blister rust from British Columbia to Minto Creek near Mt. Jefferson occurred in approximately 11 years (1910-1920), it is the consensus of opinion of many blister rust workers that the rust has surely continued into California sometime during the 13 years since 1920. Although the vast expanse of good scouting territory in southern Oregon has not, as a unit, been scouted intensively, the rust was found on Ribes in Curry County (southwestern Oregon) in 1929 and 1930 and on Ribes at Lava Lake at the headwaters of the Deschutes River and on pines at Bohemia Mountain in 1933. This last-named center, probably of 1927 origin, is 90 miles southwest of the Minto Creek infection and only 110 miles from the California line.

Previous to 1933 only extensive scouting work had been carried on. The establishment of the NIRA program in August made it possible to start intensive scouting in northern California. Six men and 3 trucks, making three 2-man scouting crews, arrived in northern California the first of September. Each crew was equipped with an outfit suitable for camping which was needed in the back country work. Maps and data on previous scouting were supplied by Root and Benedict and additional maps and excellent assistance were obtained from the officers of the several National Forests in which the scouting was done.

After a few days study of the Ribes species in the coastal section near Crescent City, and the interior near Yreka and Mt. Shasta City, each of the crews started on its assignment. Crew No. 1 with Crescent City as a temporary base was assigned the coastal fog belt, working inland to the summit of the coast range and as far south as possible in the short fall period. Crew No. 2, with Yreka as a temporary base, was given the area west of the Pacific highway and to the coast range, taking in the Klamath, Scott and Salmon River drainages and their tributaries. The north fork of the Trinity River was set as a temporary southern limit. Crew No. 3, with Mt. Shasta City as a base, was assigned all areas east of the Pacific highway and south toward Red Bluff as a temporary limit. Some of the main drainages worked by the coast crew were: Smith River and tributaries, lower portion of Klamath River, Prairie Creek, and Redwood Creek. The Smith River and tributaries head in the Siskiyou National Forest and the others mentioned either head in the Klamath National Forest or flow through that region.

Crew No. 2 confined its activities almost entirely to the Klamath National Forest, covering such major drainages as the Klamath, Scott and Salmon Rivers with their tributaries. During the latter part of October a part of the Trinity River, from the mouth through the Hoopa Indian Reservation to the town of Willow Springs, was scouted. A large part of this intermountain region is inaccessible due to absence of roads. For this reason arrangements were made with the Forest Service for the use of pack stock, and a week was spent scouting the higher elevations in the Marble Mountains primitive area.

Crew No. 3 found itself forced to travel a great deal because of poor scouting conditions. Much of the area being very arid, it was a hit-and-miss proposition. Parts of Siskiyou, Shasta, Lassen, Plumas and Tehama Counties were

covered during September. During October this crew worked westward into Trinity and Humboldt Counties where scouting conditions were somewhat better than in the more arid interior. The major drainages scouted were: Shasta, McCloud, Pit and Sacramento Rivers in the east central region and the Trinity, Mad and Van Duzen Rivers to the west. Parts of Shasta, Lassen, Plumas and Trinity National Forests were scouted.

After spending two months of intensive scouting through northern California, it is possible for the scouting force to make recommendations for any future program that might be undertaken. The intermountain region presents the best areas for intensive scouting. In this area is included the coast mountains where the upper Smith River drainage offers fair association of susceptible pines and Ribes. For intensive scouting, the high mountain ranges, which include the Marble Mountains and Salmon-Trinity Alps primitive areas, are very favorable. Here are found conditions very similar to those in northern Idaho, especially at elevations of 6,000 feet and over. The Warner Mountains in northeastern California also offer a region for future intensive scouting since the higher elevations support an abundance of 5-needled pines and Ribes growing in close association.

Very few areas in the east central region covered by crew 3 can be recommended for future intensive scouting. Good scouting areas are very scattered due to the extent of arid, semi-desert lava flows and dry, hot valleys. However, such localities as those adjoining the towns of Weed and Mt. Shasta City are important. Good scouting was reported from the Mt. Lassen area and also in the vicinity of Forest Glen.

For extensive scouting numerous areas are available, being easily reached by automobile roads. The Klamath National Forest offers a large accessible area with good scouting along the principal rivers and creeks. R. klamathense and R. cruentum are found in abundance along the Klamath, Scott, and Salmon Rivers with scattered sugar pine in association. Exceptionally good scouting is found along Indian Creek near Happy Camp where R. bracteosum is closely associated with sugar pine. The coastal region provides excellent scouting on Ribes but the absence of closely associated pines reduces considerably the value of this region as an index of rust spread into California.

Many theories have been advanced concerning the route of rust spread into California. The coastal region, with its moist weather which is favorable for fungus development, would seem the logical region of entry. The abundance of susceptible Ribes is also a strong point for the argument. However, within this region the pines are practically absent, which would prevent any establishment of infection centers. Another point against coastal infection is the fact that prevailing southwesterly winds blow inland from the ocean the greater part of all seasons which should prevent any spores from coming in on wind currents. This leads me to believe that rust will enter through an inland route, but at what point remains to be determined.

In Oregon we find pine infection at Mt. Hood, near Mt. Jefferson, and at Mt. Bohemia near the south side of Lane County. This last infection men-

tioned is approximately 110 miles air line from the California line and it is reasonable to believe that other points of infection of the same age are to be found farther south in Oregon and northern California.

Although rust was not found in California this last season, I am still entertaining the opinion that it is present. Further, I believe it will be found to be the result of a fairly long distance spread through the medium of upper air currents and not the usually referred to surface winds.

The summary of results from approximately two months scouting in northern California shows an area intensively scouted comprising parts of the counties of Del Norte, Siskiyou, Humboldt, Trinity, Shasta, Tehama, Lassen, Plumas and Butte. Thirty-nine thousand eight hundred fifty Ribes and 2,989 pines were examined. Much valuable information regarding areas for intensive and extensive scouting and areas to be eliminated from future programs was gathered. Up to the present time no rust has been found in California.

COSTS OF CLEARING RIBES INERME BY BULLDOZER METHOD, 1933

John F. Breakey

The costs of clearing stream bottoms of R. inerme by heavy tractor equipment is of interest to all engaged in Ribes eradication. A table showing the amount of time spent on each particular locality where the machine worked in the Coeur d'Alene National Forest is of value because it is indicative of the amount of time required as a training period for new men and operators.

The area worked at Burnt Cabin Creek was the most difficult encountered during the season. The per acre man days and machine hours for the Horse Heaven Ranger Station district and the Tepee Creek country are examples of what may be expected under average conditions from a trained crew using a machine that is mechanically in good running order.

Activity Costs - Machine - Stream Type - (Bulldozer)

A. Supervision	$722.40	
B. Wages	3,516.00	
C. Travel	45.61	
D. Transportation	125.00	
E. Equipment	1,010.00	
(special dep. @ $1.25 per hour)		
F. Subsistence supplies	689.50	
G. Machine fuel supplies	575.00	
" repairs	360.00	
H. Burning		
1. Wages	400.00	
2. Pump rent, gas, oil	54.00	$7,497.51

($3,867.93 undepreciated special equipment)
($7,497.51 ÷ 157.8 acres = $47.51 per acre)

TABULATION OF BULLDOZER RESULTS ON ALL AREAS WORKED IN 1933

	Thiesen Creek		Honey-suckle R.S.		C. d'A. River Burnt Cabin Creek		Horse Heaven R.S.		Magee R.S. Tepee Cr.		Totals	
	Mach. Hrs.	Man Days	Mach. Hrs.	Man Days	Mach. Hours	Man Days	Mach. Hrs.	Man Days	Mach. Hrs.	Man Days	Mach. Hrs.	Man Days
July	160	158									160	158
August	53	46	128	120	43	42					224	208
Sept.					40	26	163	139			203	165
October							36	25	185	122	221	147
November										20		20
Totals	213	204	128	120	83	68	199	164	185	142	808	698
Acres	28.25	28.25	23.00	23.0	10.10	10.10	49.15	49.15	47.50	47.50	158	158
Per Acre	7.5	7.2	5.56	5.2	8.21	6.7	4.05	3.3	3.9	2.9	5.11	4.44

Gallons gasoline per hr. 3.2
" motor oil per hr. ..... .125
" track and transmission oil per hr. 1
" hoist oil per hr. ..... .04
Pounds Alemite per hr. ..... .05

TALKS AT CIVILIAN CONSERVATION CORPS CAMPS

M. C. Riley

As a part of an educational program being given this winter for members of Civilian Conservation Corps camps in Region One, this office has prepared a talk to be accompanied by a set of lantern slides on the subject "Protecting Our Forests From White Pine Blister Rust". Other subjects to be presented during the winter by the Forest Service and other Government agencies are "Our National Forests", "Timber as a National Forest Resource", "Our Farms and Forests", "Our Big Game as a National Forest Resource", and "Protecting our Forests from Forest Insects". Alternating with these talks will be a series of motion pictures.

This educational training is being furnished to the men in three camps in the Nezperce group, three camps in the Spokane group, five camps in the St. Joe group, and six camps in western Montana. Each group of camps has its own baloptican and operator.

The slides to be used for the blister rust talk have been chosen with the idea of making the presentation as non-technical as possible. A number of new slides have been prepared to be used for this talk and some of the new ones can well replace some of those showing out-of-date methods. Notable additions are a new life cycle slide and one illustrating the manner in which the disease spreads.

It is planned to precede the showing of the slides with an introductory talk which will not be of a technical nature and which will cover the history of the disease, values at stake, and the control work being done. This will be limited to not more than 10 minutes. The slides will be shown in the following order: life cycle, manner of spread, and known extent of blister rust infection on white pine and Ribes, pine areas, working conditions, hand and chemical eradication "before and after" series of bulldozer and slashing operations, views of small camps, pack train strings and various scenes and activities around Civilian Conservation Corps camps taken during the past summer.

The schedule for these talks starts on January 30 in the Nezperce group and follows through the Spokane, St. Joe and Montana groups, ending on March 2.

A FEW FACTS AND FIGURES ON THE PHOTOGRAPHIC WORK DURING 1933

H. M. Cowling

It can be said that the photographic department came into its own during the year of 1933. In the past, the value of photography in relation to all of the departments of this Division seemed to be of minor interest to the project leaders as a whole. The season just past reversed itself into a case of the photographer having a major problem of supplying the demand.

As a result of the combined requests from the project leaders operating from the Spokane office, 195 ground pictures were taken in the field. One mosaic aerial map covering 113 square miles was made of the Clarkia, Idaho area and 721 aerial oblique pictures were taken from an average altitude of 10,000 feet of the drainages of the Inland Empire supporting white pine.

Cost figures were of great interest particularly in regard to the aerial photography. Through the use of airplanes of the 116th Observation Squadron and the equipment of the 116th Photo Section, 41st Division Aviation, Washington National Guard, cost figures were exceptionally low. Mapping of the Clarkia area at 15,000 feet cost eight-tenths of a cent per acre or $6.00 per square mile including maps delivered to project leaders in the field. Aerial oblique pictures covering approximately 15 square miles each cost $1.05 per picture including one print of each picture taken.

The operation of our own dark room showed a surprising saving. If all the work going through the laboratory had been done outside by a commercial finisher as was the procedure several years ago, our photographic bill would have been $2,135.72. The cost of materials used to turn out that volume of work was $353.42, which leaves $1,782.30 to charge off against salaries, etc., related to the operation of the dark room finishing.

These figures show that this Division is certainly getting information and disseminating it at a minimum cost.

STUDIES IN EFFECTIVENESS OF CONTROL

E. L. Joy

Early in the development of the blister rust control program it was found that it was not humanly possible by the approved methods to eradicate all the Ribes from a stand of white pine during the first working of the area. Later it was determined that two, three and even more times over the same ground did not result in the perfect job.

During this same evolutionary period the consideration of cost showed us that we had no right to anticipate the removal of every last inch of Ribes live stem if we expected to put the control program on a business-like basis. Consequently we have adopted a policy that makes blister rust control a profitable business by planning for (1) efficient but financially reasonable initial Ribes eradication, and (2) additional workings of areas when they are subject to efficient and financially reasonable treatment.

It is apparent that in a region where the rust was well established before control was started, namely, the Inland Empire, we are compelled to assume some losses due to delayed initial work and additional losses due to the spread of the rust by Ribes remaining or originating after this work. It is in connection with these points that we are studying the rate of rust development at pine infection centers in order to get some measure of the pine protection afforded by Ribes eradication.

Two lines of study of this problem are being followed. They are: (1) the growth and regeneration of Ribes following eradication, and (2) the effect of known amounts of Ribes per acre in spreading and intensifying blister rust. This paper is the preliminary report of the results of these studies to date.

The Growth and Regeneration of Ribes Following Eradication

For the purpose of studying the growth and regeneration of Ribes following eradication, 247 stream type plots in 14 drainages were established immediately preceding the initial Ribes eradication in 1929, 1930 and 1931. The Ruby Creek plots will not yield results until next year, due to the delay of initial eradication from 1931 to 1933.

Of the 247 plots established we are using 176 which comprise those that supported Ribes growth before the initial disturbance. At present we have Ribes data from plots that fall into eleven distinct classifications as follows: immediately before and immediately and one, two, three and four years after the first eradication only; immediately and one and two years after the second working; and immediately and one year after the third eradication. Table No. 1 shows for each drainage the amount of Ribes old growth and seedling live stem per acre before and at various intervals after Ribes eradication.

TABLE NO. 1

FEET OF RIBES LIVE STEM PER ACRE OF ALL RIBES SPECIES BEFORE AND AFTER ERADICATION

Potlatch Timber Protective Association

Erad. Status	Feet of Ribes Live Stem Per Acre																				
	Elk-Potlatch Cr.			Mallory Cr.			Deep Cr.			Johnson Cr.			Cameron Cr.			Shattuck Cr.			Ruby Cr.		
	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total
Imm. bef. 1st erad.	113649	0	113649	59524	0	59524	25804	0	25804	39560	0	39560	41266	0	41266	66651	0	66651	12710	31	(2) 12741
Imm. aft. 1st erad.				792	0	792	496	0	496	1849	0	1849	2441	T	2441	3692	0	3692			
1 yr. aft. 1st erad.	339	412	751	890	106	996	804	6	810	2158	31	2189	3370	18	3388	8404	1	8405			
2 yrs. aft. 1st erad.	558	176	734	1200	45	1245	626	1	(1) 627												
3 yrs. aft. 1st erad.	391	460	851	783	119	902	895	0	895												
4 yrs. aft. 1st erad.	572	322	894	1182	421	1603	572	6	(1) 578												
1 yr. aft. 2d erad.										950	13	963	630	19	649	1117	25	1142			
2 yrs. aft. 2d erad.										1552	64	1616	725	29	754	1171	47	1218			

(1) Reductions caused by grazing and logging.

(2) Although plots were established before fire in 1931, new basic data were taken in 1933 before first complete eradication.

T = Trace.

TABLE NO. 1 (Cont'd.)

FEET OF RIBES LIVE STEM PER ACRE OF ALL RIBES SPECIES BEFORE AND AFTER ERADICATION

Clearwater Timber Protective Association

Erad. Status	Feet of Ribes Live Stem Per Acre																			
	Deer Creek			N. Fk. of S. Fk. Reeds Cr.			S. Fk. Reeds Cr.			N. Fk. Reeds Cr.			Alder Cr.			Loop Cr.			Orofino Cr.		
	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total	Orig.	Seed.	Total
Imm. bef. 1st erad.	49638	0	49638	66098	0	66098	43798	0	43798	38290	0	38290	20040	0	20040	43375	0	43375	12064	0	12064
Imm. aft. 1st erad.	202	0	202	185	0	185	139	0	139				1418	0	1418	858	0	858			
1 yr. aft. 1st erad.	544	56	600	611	201	812	244	106	350	1260	21	1281	2105	13	2118	1457	35	1492	175	0	175
2 yrs. aft. 1st erad.	289	29	(1) 318	892	885	1777	608	385	993	2165	168	2333	3246	41	3287	2223	125	2348	592	2	594
Imm. aft. 2nd erad.																					
1 yr. aft. 2nd erad.	121	13	134	54	42	96	107	20	127	553	11	(2) 564	978	13	(2) 991						
2 yrs. aft. 2nd erad.	281	59	340	182	59	241	360	64	424	843	17	(2) 860									
Imm. aft. 3rd erad.																581	0	581			
1 yr. aft. 3rd erad.													320	23	343	767	0	767			

(1) Reduction caused by logging railroad construction.
(2) Partial third eradication before plots were checked.

In Table No. 1 it is seen that in only two instances, one on the East Fork of Potlatch and one on Mallory Creek, was there a reduction in Ribes live stem between inspections without Ribes eradication or other disturbance. No adequate explanation of these decreases can be given. However, for statistical treatment we can consider them as normal in view of the fact that we have records of annual increases in 28 out of 30 cases.

In computing average annual growth it was immediately seen that there is a distinct difference in rate of Ribes growth between the two regions roughly defined as the Potlatch and Clearwater Timber Protective Associations. More accurately, these differences are between the Bovill-Elk River and Pierce-Headquarters regions. For each of these regions the following annual growth data were computed.

TABLE NO. 2

AVERAGE PERCENT ANNUAL INCREASE IN TOTAL RIBES LIVE STEM

Region	Increase in Ribes Live Stem Per Acre		
	Minimum	Maximum	Average
Potlatch Timber Protective Ass'n	-27.6	+127.7	36.8
Clearwater " " "	+32.0	+338.9	76.0
Both	-27.6	+338.9	51.3

Table No. 2, therefore, indicates that after eradication Ribes live stem at the rate of 100 to 3,700 feet per acre on the Potlatch and Clearwater Association lands will show an average increment of 51 percent. This gives rise to the question of how much of this is seedling live stem. The percent of total live stem that resulted from seedlings is shown in Table No. 3.

TABLE NO. 3

PERCENT OF TOTAL RIBES LIVE STEM RESULTING FROM SEEDLINGS

Eradication Status	Potlatch T.P.A.	Clearwater T.P.A.	Both
1 yr.aft. 1st erad.	2.8	4.8	3.5
2 yrs.aft.1st erad.	10.3	12.3	12.0
3 yrs.aft.1st erad.	23.3		23.3
4 yrs.aft.1st erad.	24.8		24.8
1 yr.aft. 2d erad.	2.2	3.2	2.7
2 yrs.aft.2d erad.	3.9	10.3	6.2

Table No. 3 brings out the following important points:

1. Not only is the total Ribes growth rate greater (table No. 2) but the seedling live stem forms a larger percentage of the total in the Clearwater than in the Potlatch region.

2. In both regions the data thus far show that the percentage of total live stem that is attributable to seedlings, increases annually. However, this

increase appears to be less rapid during the fourth year than during any one of the preceding three, which indicates that a fairly constant ratio between old bush live stem and seedling live stem will be reached perhaps between the fifth and eighth year. Since it is obvious that the theoretical relation between old growth live stem and more old growth live stem is constant, can't we conclude that seedlings will have reached the mature or old growth stage when the ratio between seedling and old growth live stem becomes constant: i.e., between the fifth and eighth years. This should help to answer the question, "When does a seedling become an old bush?"

3. Since the increase in the percentage of total live stem that is attributable to seedlings is less in the fourth than in any preceding year, we can conclude that the second eradication should not be contemplated before the third year following the first working.

BLISTER RUST INFECTIONS IN THE UNITED STATES AT THE END OF 1933

The following is the latest report showing the status of the various states in the several infection zones:

State	Host Plants		State	Host Plants	
	On Pine	On Ribes		On Pine	On Ribes
Main	Yes	Yes	West Virginia	No	Yes
New Hampshire	Yes	Yes	Ohio	*Yes	Yes
Vermont	Yes	Yes	Indiana	*Yes	Yes
Massachusetts	Yes	Yes	Iowa	Yes	Yes
Rhode Island	Yes	Yes	Michigan	Yes	Yes
Connecticut	Yes	Yes	Wisconsin	Yes	Yes
New York	Yes	Yes	Minnesota	Yes	Yes
New Jersey	Yes	Yes	Montana	No	Yes
Pennsylvania	Yes	Yes	Idaho	Yes	Yes
Maryland	Yes	Yes	Washington	Yes	Yes
Virginia	Yes	Yes	Oregon	Yes	Yes
			California	No	No

*On stock imported from Europe in 1910 and 1911. Stock destroyed and no additional pine infection found.

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U. S. Department of Agriculture
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Spokane, Washington

PREERADICATION SURVEY AND FUTURE WORK IN THE INLAND EMPIRE

F. J. Heinrich

After the termination of the 1933 field eradication season, a pine survey was conducted in northeastern Washington, north Idaho and northwestern Montana. The purpose of the survey was to secure information on which to base future blister rust control work. Data were recorded in regard to timber type, age class, degree of stocking in all types for all age classes, and eradication type. The Ribes working class, concentrations of Ribes inerme, extent of R. petiolare, and amount of chemical needed were also determined. Possible camp sites, locations and conditions of roads, pack trails and footways were determined and recorded on all areas covered. The locations of any new blister rust infection centers found were recorded.

The survey parties consisted of a chief of party, cook and from four to eight technical recorders. School was held for all members in order that all data taken would be uniform and consistent throughout. The men worked on areas known to be largely white pine type and sufficient time was spent on each area to obtain accurate information. The route of travel was determined according to topographical conditions and not by cardinal direction. Such courses were taken which would permit maximum use of observation points. The route of travel was marked on the type map.

When the last party returned to official headquarters from the snow capped peaks on November 11, it was found that the 30 men on this survey had covered a total of approximately 1,250,000 acres and all necessary data were recorded on all areas worked.

The survey acreage on National Forests and timber protective associations are as follows:

	Acres
Cabinet National Forest	71,180
Pend Oreille National Forest	200,670
Kootenai National Forest	74,180
Kaniksu National Forest	118,820
Coeur d'Alene National Forest	40,000
St. Joe National Forest	516,740
Clearwater T.P.A.	46,500
Potlatch T.P.A.	114,680
Northeastern Washington	38,950
Total Acreage	1,221,720

In addition to the above figures, 31,000 acres were covered on the lower Pend Oreille County, in Washington, and in the Fish Creek drainage, near Twin Lakes, Idaho, making a grand total of 1,252,720 acres covered during the fall survey. Had weather conditions permitted over two million acres would have been covered. The total acreage given does not mean that all of this area will be protected. Many acres will be eliminated due to the low white pine values.

When preeradication survey data were assembled they comprised a basis on which to estimate the amount of work needed to give protection to the white pine within the Inland Empire from white pine blister rust.

The following table shows the approximate acreage of white pine type not having had initial control work in the Inland Empire:

	Acres
Clearwater National Forest	105,000
Clearwater T.P.A.	222,000
St. Joe National Forest	562,000
Potlatch District	283,000
Coeur d'Alene N.F. Control Unit	226,000
Kaniksu National Forest	273,000
Pend Oreille National Forest	210,000
Priest Lake T.P.A.	93,000
Pend Oreille District	89,000
Eastern Washington	42,000
Western Montana	299,000
Total Acreage	2,404,000

Undoubtedly some of the above acreage is in blocks too small to warrant blister rust control measures. Furthermore, some of the area does not represent values sufficient to justify control work. However, the size of the remaining Ribes eradication job can readily be seen, and the necessity for carrying on this work on a large scale cannot be overlooked.

INFECTION RELATIVE TO PINE AND RIBES ASSOCIATION

L. N. Goodding

The Bohemia Mountain region is an old mining district. As a result there are several clearings, at present growing up to brush and second growth fir and pine. In these clearings there is an abundance of R. bracteosum and R. sanguineum as well as numerous pines from five to twenty-five years old. In scouting up Brice and Champion Creeks, blister rust was found at several points all within three miles of the old Champion mill, on R. bracteosum and at one point on R. sanguineum. At the old mill clearing, Sec. 36, T. 22 S., R. 1 E., rust was found very sparingly on Ribes and on three pines. One of these was practically touching a R. bracteosum bush and had three cankers, two on 1926 wood and one on 1927 wood. These had fruited once. On a second tree slightly removed from the one just mentioned was found a trunk canker about one foot long. The rust had entered by a side branch which was evidently very short and the rust had entered the trunk promptly. This canker had fruited once apparently but not since entering the trunk canker. On a third tree a small aborted canker was found on 26-year wood. Above this area is a slender belt of timber and above this a second clearing perhaps a quarter of a mile distant. Here pine and Ribes are again intimately associated but I was unable to find rust on either.

On the west slope of the mountain along the Sharps Creek road, associations are not so good. A light infection was found on R. bracteosum at the base of the mountain.

CHECKING METHODS

Albert L. Pence

The checking organization was set up to guarantee that protection is being given to all white pine areas worked by blister rust crews, and not to merely check the efficiency of any one job. In order to get an unbiased picture of the Ribes left, it was thought best to set up the personnel of this organization separate from the regular Ribes eradication forces.

Checking is based upon the theory of sampling. That is, samples of any product, taken at random and not selected, should be representative of the product as a whole. Repeated in blister rust terminology it becomes this: samples of worked areas taken regardless of location, will be representative of the Ribes conditions on the entire area.

Samples of the worked areas are taken and the amount of Ribes live stem left upon them is determined. Ribes live stem is the actual growing stem producing leaves upon a Ribes bush. Feet of Ribes live stem is the actual measure in linear feet of this growing stem. That figure which determines the efficiency of the work is the amount of Ribes live stem left per acre. This is found by totaling the feet of live stem of all the species found on the check plots and dividing this figure by the actual acres covered by the plots. By so doing, an average is taken of all the samples to get a representative figure for that unit of area.

The method of sampling last summer was simple but very systematic. Each checker was supplied with a compass, a tally machine and forms for recording his data. They were all instructed as to the proper use of their instruments and the standard method of recording data.

Figuratively, checking consists of three parts carried on simultaneously: following a compass line, determining distance by pacing along that line, and looking for Ribes. The unit of distance used was the chain, which is 66 feet in length. The width of each check strip is two-tenths of one chain, or 13.2 feet. This is the width of strip a person can conveniently cover when it is necessary to part the brush and look for Ribes.

As the checker progressed along a strip and a Ribes bush was found, he would record the feet of live stem in the bush, its species, the chain in which it was found, and the eradication type. Each point on the strip where the eradication type changed would be noted. This process is repeated for each strip.

These strips were run parallel to each other within each block and at intervals of five chains. By this method four percent of the area was actually inspected.

In camp these Ribes data are summarized for every five chains of strip run, and the summaries are plotted on the map in that transect in which they were found. On the map they are shown in the form of a fraction. The numerator represents the number of Ribes within the five-chain transect, and the denominator shows the total feet of live stem.

The checkers' map as a whole is simply a graphical presentation of the Ribes distribution on an area as disclosed by the sample check.

If areas were disclosed upon which poor work had been done, they were rechecked after the crews had reworked them. That phase, namely, checking the areas immediately after eradication, is invaluable. It makes it possible for the areas to be reworked while the crews are still available.

Stream type checking was carried on somewhat differently. Owing to the greater Ribes population before eradication it was thought best to give it a higher percent of check. This was believed necessary, too, because the Ribes are not as evenly distributed throughout this type as on the upland. The most common method used was that which was called the "diagonal strip" method. The checker standing on one boundary of the stream type would pick out a point on the other side some distance along the stream and make his way toward it, following the same procedure of recording Ribes as on the upland strips. This procedure was repeated, producing a zigzag course down the stream. This resulted in a percent of check varying from 8% to 50%, depending upon the width of the stream type. On extremely wide areas of stream type the same methods were used as on the upland.

Where streams were encountered on a check strip of upland types, a 4-chain plot was run on them. This, of course, was only done on those streams that were not to be checked separately.

Another step that was innovated last field season was what is commonly called the advance check. This is a check that is run on areas that have not been worked, but that are relatively free from Ribes. A two percent check, which consists of strips at intervals of ten chains, is run on the area first. If the Ribes live stem count was not too high, the additional strips were run to make the check cover four percent of the area. If this did not increase the total live stem count per acre, or disclose any Ribes concentrations, the area would be eliminated from work on the basis of being comparatively free from Ribes. If Ribes patches were disclosed, only that part of the area containing these concentrations was worked.

The method of presenting the Ribes data on the map is undoubtedly the best feature of the entire system. It gives a picture of the Ribes distribution on an area that helps considerably in reducing the per acre cost of eradication. This is brought about by disclosing those portions of large areas that will need the first working, in the case of the advance check, and those portions that will need reworking, in the case of a check on worked areas.

Checking, then, has assumed quite an important role in the blister rust control drama. With a more experienced cast next year we should be able to give a more laudable performance.

worked in 1927.

THE EFFECT OF KNOWN AMOUNTS OF RIBES PER ACRE IN SPREADING AND INTENSIFYING BLISTER RUST

E. L. Joy

In order to obtain a measure of the effectiveness of Ribes eradication in controlling blister rust, several pine infection centers adjacent to areas eradicated of Ribes in 1927, 1929 and 1930 were studied. Also centers on unworked areas were studied to give an index of the rate of normal disease intensification since the eradication years. Table No. 1, on the next page, gives the results of these studies.

It is seen that on the areas where there has been no Ribes eradication the percentage of total cankers formed after the eradication years ranges from 63 to 99, while on the worked areas the range is from 0 to 91. The high percentages of cankers formed after eradication on the North Fork of Reeds Creek area, one and three-quarters miles below Headquarters and the South Fork of Reeds Creek area three-quarters mile below the road, are explained by the close association of small amounts of Ribes petiolare and not by large amounts of Ribes throughout the drainage. This point is partially substantiated by the data in column three which show that the percentages of infected trees are not high. In other words the intensification after eradication was very local, occurring for the most part on previously infected trees, or those immediately adjacent.

It is also notable that in general there appears to be no direct relationship between the amounts of Ribes live stem on these areas and the percentages of cankers formed after the eradication years. That is, the smallest amount of Ribes per acre caused the greatest percentage increase in cankers on both the unworked and worked areas. This lack of relationship is even more distorted on the Snake Creek area because we found that the 302 feet of R. viscosissimum have been responsible for several times the intensification caused by the 771 feet of R. lacustre.

These facts show us that when dealing with large amounts of Ribes we cannot point too critically at specific cases but must look for differences through averages. Therefore, it is significant that for the unworked areas new cankers comprised 93 percent of the total, and for the worked areas 43 percent. This 50 percent reduction resulted from the removal of Ribes live stem to a point where an average of not less than 100 nor more than 3,400 feet per acre were present during each year since eradication.

If the average of 8 areas with 100 to 3,400 feet of Ribes live stem per acre shows a 50 percent reduction in new cankers, what will be the result of Ribes removal to 25 feet per acre? The first impression is that Ribes eradication to this point will almost stop the rust which is true if we consider only the 25 feet. However, if the average annual Ribes live stem increase is 51 percent, (determined from stream type check plots) the 25 feet compounds to over 100 feet in 4 years and over 1,000 feet in 9. Therefore, in order to capitalize on our initial eradicative efforts, it is imperative that we plan timely and adequate maintenance eradications to keep the Ribes population at a point where the pine losses will not be excessive.

TABLE NO. 1

Canker Intensification Rate at Pine Infection Centers as Determined in 1933

A. Areas From Which Ribes Have Not Been Eradicated

Infection Center Location	Ribes Eradication	Percent Trees Infected	No. Trees Studied	Ribes Feet Live Stem Per Acre on Area, 1933					No. Cankers Originating			Percent Cankers Orig. After Erad.
				R. pet.	R. vis.	R. lac.	R. iner.	All Species	Before Eradication Year	After Eradication Year	Total	
Snake Creek	None	16	59		302	771		1,073	(b) 22	2,035	2,057	98.9
Crystal Creek	None	60	42		6,025	1,646		7,671	(b) 116	700	816	85.8
Ruby Creek	None	25	11	9,430		3,040	271	12,741	(b) 16	157	173	90.8
Mazie Creek	None	5	25	3,000		500		3,500	(b) 12	56	68	82.4
N Fork Merry Creek	None	10	15	5,000		1,000		6,000	(b) 35	146	181	80.7
Little N. Fork Coeur d'Alene River	(a) None	70	10			848	7,045	7,893	(c) 32	55	87	63.2
Average												93.1

B. Areas From Which Ribes Have Been Eradicated

Little N. Fork Coeur d'Alene River	1927	70	10			312	1,088	1,400	146	32	178	18.0
N. Fork Reeds Creek $1\frac{3}{4}$ miles below Headquarters	1929	21	9	502		358		860	4	36	40	90.0
N. Fk. Reeds Cr. $\frac{1}{2}$ mile below Headquarters	1929	20	13	502		358		860	12	8	20	40.0
S. Fk. Reeds Cr. $\frac{3}{4}$ mile below road	1929	20	11	110		47		157	14	145	159	91.2
Deer Creek (main)	1929	10	13	** 136 # 92		** 210		438	18	19	37	51.4
Deer Cr.-Wn. Trail Fk.	1929	12	7	399		41		340	23	0	23	0.0
Johnson Creek	1930	4	6	307	28	229	1,052	1,616	9	0	9	0.0
Cameron Creek	1930	10	8	241		71	442	754	91	0	91	0.0
Average												43.1

(a) This part of infection center not eradicated of Ribes 1927.
(b) Assume 1929 as year of eradication.
(c) Assume 1927 as year of eradication since lower part of infection area which is reported in part B was worked in 1927.
** Upland
# Stream

RIBES ERADICATION ON THE COEUR D'ALENE NATIONAL FOREST

W. G. Guernsey

The Coeur d'Alene National Forest was the scene of two very interesting phases of Ribes eradication. Of course, we used hand pulling as our principal means of Ribes removal. However, there were two other methods of eradication used. Ribes eradicated by slashing, piling and burning was a second method, and the almost complete extermination of all heavy Ribes concentrations by means of machinery (bulldozer style) was the third method.

The following data pertain mainly to slashing work. This information includes the slashing of brush on Laverne Creek, a tributary of the Little North Fork of the Coeur d'Alene River below Honeysuckle Ranger Station.

Pulling and Slashing

Crew leader man days, 24 @ $3.80 per day	$90.20
Pulling and slashing man days, 109.5 @ 3.50 per day	383.25
Total cost labor pulling and slashing	$473.45

Burning Slashed Area

41 man days. Total cost	$146.80
Cost per acre for burning, includes cost 10. gals. gas used for torch	10.48

Total number man days pulling and slashing	133.5
Total number acres covered	14
Cost per acre for pulling and slashing	$33.82

Total cost $260.25 ÷ 14 acres = $44.30 per acre.

The slashing method used was to cut, pile and burn all brush. All Ribes around the brush piles were pulled, placed on the brush piles and burned. The brush was so dense and the Ribes so thick it was thought impossible to obtain efficient eradication by hand pulling methods.

It was necessary to burn this slash debris at night to insure protection to surrounding timber. This precaution increased the cost of burning somewhat but was worthwhile as a protection measure. As an added precaution we used two men on patrol for forty-eight hours after the brush had been burned.

In checking over this area covered by slashing crews, it appears to be a satisfactory practice if there is very little grass present. Where grass was heavy it was impossible to pull or burn the Ribes roots and many of these roots were sprouting. However, in spots that had little or no grass present there appeared to be no return, or sprouting of Ribes. Safer deductions will be made when this area is checked during the 1934 field season, as actual results will be noted at that time.

The third Ribes eradication method used was eradication by the use of machinery (bulldozer). This method is the most satisfactory one used to date on areas having heavy concentrations of Ribes inerme.

Initial results point to this work as having accomplished a very important step in stream type Ribes eradication. There were 158 acres worked by this method at an average cost of $47.51 per acre. More power to Johnson, Breakey and other Ribes exterminators who have been active in this endeavor!

PERMANENT RIBES ERADICATION RECORDS AND REPORTS

S. E. McLaughlin

The greatly increased Ribes eradication program for 1933 over previous years made it necessary to add new reports and change some used in previous years.

The reports and records are compiled to show, in condensed form, all information necessary regarding the actual work accomplished. They are organized under two main headings: those used for the annual blister rust control report, and those for permanent filing.

The annual Ribes eradication report is headed by a brief summary of work done in the Inland Empire. This includes a discussion of the organization, different projects, number and kind of camps, method, personnel, expenditures and other important items. Accompanying this discussion is a set of tables which shows the expenditures and work accomplished. This is followed by separate project reports. The project report includes a description of the area, organization and method of work by the following tables of expenditures and work accomplished.

Table #1 - Initial Ribes Eradication by Working Units
Table #2 - First Mop-up Ribes Eradication by Working Units
followed by tables of second and third mop-ups, if any.
Table #3 - Summary of All Ribes Eradication by Working Units
Table #4 - Summary of All Working Units Ribes Eradication by Type

Three divisions when necessary:
A. Total Ribes Eradication of ECW Camps
B. Total Ribes Eradication of NIRA or Regular Camps
C. Total Ribes Eradication of NIRA and ECW Camps

The working units are the smallest areas treated in the annual report. They are marked off by stream drainages and are permanent working area divisions with reference to blister rust control records.

Accompanying each project report is a small photographed map showing working unit boundaries and area worked.

Enlarged photographic copies of Tables Nos. 1, 2, 3 and 4 with project descriptions are placed in a large summary book for permanent filing.

A master plan book (26"x 28") will be made up for each project and will contain the following information:

1. Map (on 2" scale) showing progress by years and working units. Opposite this map will be a table of eradication summary by type of that working unit.
2. Ribes eradication type map by working unit (2" scale).

This map will show the divisions of working unit used in the field and their working condition. All methods of Ribes eradication will be shown by color or sign legend. The number of acres, Ribes per acre, and man days will be recorded within each type.

In addition the permanent files will include the following maps:

1. Timber age class map in a township plat book.
2. Timber type map in a township plat book.
3. Burn - showing year and kind of fire in a township plat book.
4. Cutover - showing year, type and method of cutting in a township plat book.
5. Ownership - by color legend in a township plat book.
6. Roads and trails - by forest on a large map.
7. Ribes zone map.

The map filing cabinet will contain the following maps by projects:

1. Progress eradication-by forest showing working unit divisions, and year worked by color legend.
2. Timber type - by forest; shows white pine in 2 age classes (0-80 and 81+).
3. Ownership - by forest, color legend by owners.
4. Burn - by forest, year and kind of fire.
5. Cutover - by forest, method, type and year cut.
6. Checkers map - by forest.
7. Age class - by forest.
8. Planting - by forest, area and year planted.
9. Aerial - made up from aerial photographs.
10. Miscellaneous.

In addition special reports are sent to the Washington office, various Forest Service offices and timber protective associations.

THE SLASHING OF HEAVY RIBES INERME CONCENTRATIONS IN STREAM TYPE

D. F. Williams

Slashing as a stream type Ribes eradication method was first tried on the St. Joe National Forest in 1932, when heavy R. inerme areas were slashed on Big Creek and The Little North Fork of the St. Joe River. As the success of the 1932 work was unknown, the workability of slashing as a Ribes eradication method was not established until last summer. During the past field season, slashing was again experimented with in an effort to increase CCC man-day output in areas where dense brush and heavy R. inerme concentrations were found in close association near Clarkia, Idaho.

Slashing is divided into three separate undertakings, slashing itself, piling and burning. Slashing involves the cutting down of all standing brush and secondary vegetation on an area. As the area is cleared all Ribes are pulled and piled with the other brush for burning. A location for the piles or windrows is cleared first, and the Ribes pulled from this area. The work then progresses outward from this center area. Twenty to twenty-five man crews were found to be most efficient and easily handled by one foreman on slashing work. Pulaskis were found to be the most serviceable and valuable tool for the work.

Piling is done systematically with regularly spaced piles or windrows. All brush should be piled with limbs down and butts up to insure a better burn and quicker firing of the piles. All trash and down timber is included in the piles to insure the generation of as much heat as possible to aid in killing what root crowns remain beneath the piles. When burning is difficult and incomplete, repiling and reburning is required and piles should be used rather than windrows in order to facilitate repiling and reburning.

Burning is done when conditions are favorable enough to insure a good clean burn. Burning when dry insures the generation of the greatest amount of heat possible and gives a more complete root kill, as well as destroying any seeds lying in the duff. Windrows are of the greatest advantage from this angle as a greater area is covered by the burn and more root structure and seeds are destroyed. A clean burn saves the expense of repiling and reburning. Brush should not be piled near standing timber and fire traps, as a safeguard against fires. It is essential, when burning is to be undertaken, to have sufficient men and equipment on hand to cope with any emergency as an added precaution against forest fires.

The benefits of slashing are as yet unproven except that CCC labor can best be used in this work. Other benefits should be varied in nature. First, slashing while not a complete Ribes eradication, opens up the areas so that a very efficient job can be done on the first mop-up. Secondly, R. petiolare patches are opened up so that a complete application to bushes and root crown can be administered readily, with a saving in the amount of chemical required per acre. As an area is slashed, R. inerme and R. petiolare are freed from the brush in which they are entangled and can readily be hand pulled efficiently.

With slight encouragement slashed areas would become meadowland; cattle grazing the area would aid in Ribes suppression. The removal of brush and debris should allow spring high water to run off more rapidly and thus do away with conditions that favor R. inerme and R. petiolare growth on sites removed from the creek.

The problem to be faced at Clarkia now, is whether or not the extreme high water of the past two months along with the opening up of the area and the stirring up of the duff in the operation will cause a general germination of Ribes seeds and a bumper crop of seedlings.

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W E S T E R N B L I S T E R R U S T

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U. S. Department of Agriculture
Bureau of Entomology
Division of Plant Disease Eradication and Control
Spokane, Washington

BLISTER RUST MEN ASSIST IN DUTCH ELM DISEASE CONTROL WORK

During the summer and fall of 1933 the Dutch elm disease was found in the vicinity of New York harbor. Extensive field scouting indicated that the disease had not spread beyond a 30-mile radius of the Statue of Liberty. Within that area it is present in varying abundance but in no place are all of the elms diseased as yet. It is believed to be possible to eradicate the disease in this area and thus prevent its continued spread. As a result of this discovery C. W. A. funds were made available for control on December 15, 1933, and work initiated under the direction of G. B. Posey assisted by A. E. Fivaz, both of the Division of Blister Rust Control. H. E. Swanson of the Western Office left for the East on December 31, 1933, to assist in the development of control methods and the direction of field work.

The Dutch elm disease is caused by the fungus Graphium ulmi and is so named because it was first noticed, as a destructive disease of elms, in The Netherlands. The fungus lives and spreads in the sapwood of the elm. Since its discovery in 1919, destruction of elms by this fungus has become serious in many of the European countries. Its introduction into the United States has taken place through the importation from Europe of green elm logs for veneer wood purpose. While small disease centers have been identified at one or more points in Maryland and Ohio, the infection area embracing the 30-mile zone about New York harbor is the only serious outbreak of the disease known in the United States.

Certain insects known as "Engraver Beetles" or elm bark beetles are partners in crime with the disease. These insects are attracted to and breed in the weakened bark of Graphium infected elms and weakened parts of other elms. The prolific feedings of the larvae of these beetles complete the killing of the invaded bark. The young adults emerge and take flight to the succulent elm shoots where they feed in the crotches causing characteristic feeding scars. During this feeding new infections are transmitted to the elms through the fungus spores or filaments that are carried within or on the body of beetles that have emerged from Graphium infected tissue. After a period of feeding the beetles locate new places in weakened elm bark for breeding purposes.

Three engraver beetles are feared in connection with the spread of Graphium: Scolytus scolytus, Scolytus multistriatus, and Hylurgoninus rufipes. It is believed that the Scolytus multistriatus is largely responsible for spread of the disease. The Scolytus scolytus has not yet been found in the area.

Trees of any size may be attacked and killed by the disease. Infected trees may be killed in a single year while others may not be killed for several years. Young and vigorous trees are readily killed by the disease. Both natural stands and planted elms are attacked.

Complete eradication of all infected material is the only known

cure for the disease. The area around New York Harbor over which the disease now occurs is small and since only a comparatively low percentage of the trees within this area are already diseased, prospects for the eventual eradication of the disease without serious loss are encouraging. Apparent success in eradicating the disease centers in Ohio adds to the hope in this area.

The purpose of the control program is the complete eradication of the disease within the United States. The CWA work was initiated in the infected area comprising parts of New Jersey, New York, and Connecticut with the purpose of locating and destroying all Graphium infected trees that could possibly be found during the dormant season, especially those from which beetle flight and subsequent spread of the disease would otherwise take place in the spring.

Since it is probable that many trees having incipient infections will not be discovered in one working of an area, it is obvious that complete extermination of the disease will be dependent upon proper follow-up work during the next and subsequent growing seasons to detect and destroy trees as Graphium symptoms become apparent and before additional spread takes place.

The general method of attack was confined to the systematic examination of elms for the presence of either Graphium infection or Scolytid infestation and to the proper treatment of trees where these conditions were found. In cases where Graphium infections were found, the infected trees were destroyed; in cases where Scolytid infestations were found, the infested parts were removed and destroyed. At the start of the work a careful tree to tree examination of all elms within the work area was planned. This involved the climbing and sampling of each tree for the disease and an inspection for the presence of Scolytid beetles. Samples, constitution living branches 1/2 inch to an inch in diameter were removed, and inspected by a technician on the ground for the characteristic stippling and ring discoloration common to the disease. As positive identification of the fungus could only be made by laboratory tests, samples showing brown discoloration were forwarded to a central laboratory for culture and identification. Trees from which such samples were taken were tagged and classed as suspect trees until the samples were identified as graphium or non-graphium. When the samples were confirmed as being graphium, the tree from which they were taken was removed.

The amount of work involved in this tree to tree inspection made it possible to use 15-man crews. However, as the personnel became more experienced and proficient in the work, the slow method of climbing every tree was changed whereby ground inspections only were made of trees which were apparently sound, and only those trees, which were in a weakened condition or displayed some outward symptoms that might be the result of the disease, were climbed and sampled. This made it possible to cover a greater amount of area and in so doing locate and destroy a greater number of those trees having both the disease and beetles present from which spread would take place in the spring. This change in methods was necessitated by the

limited time and funds available for carrying on the work. When this change was made, the size of crews was reduced to smaller and more mobile units.

On his return to Spokane early in March, Swanson reported that although the work was delayed somewhat by the severe winter conditions in the East, approximately 500 square miles had been covered and several hundred trees infected with the disease had been found and destroyed in the first two months of work. Most of the infected trees were found in New Jersey and only 2 had been found in Connecticut. He stated that the work was progressing satisfactorily but that complete extermination of the disease would depend upon sufficient follow-up work during the next and subsequent growing seasons to detect and destroy diseased elms which were not found during the past dormant seasons, and upon proper scouting work beyond the present known limits of infection. No trees other than those infected with Graphium will be destroyed on request or otherwise except in cases where complete removal of the tree is the only practical means of destroying a beetle infestation.

THE USE OF CHEMICALS FOR THE ERADICATION OF UPLAND RIBES

H. R. Offord

The program of eradication of upland Ribes appears to have a definite place for the use of chemicals, at least as an auxiliary method to hand pulling. In the latter work the crewmen frequently encounter specimens of Ribes viscosissimum, R. roezli, R. irriguum, and R. cereum which are difficult if not impossible to pull or dig because of size or rooting habits. Large deep-rooted bushes, those rooted under windfall or rocks, and over-mature Ribes having a brittle aerial stem and extensive root systems cause considerable trouble to eradication crews.

In the summer of 1933 the chemical investigations unit undertook several experiments in Idaho and California with the object of studying this individual bush problem. In these tests a so-called decapitation treatment was devised which may be described essentially as follows: bushes were cut off at or below the point at which the aerial stems branch from the crown; three to four ounces of chemical was applied directly to the ends of the cut-off stems or mutilated crown after the cut tissue had been moistened with a little water. Chemicals tested by this method were: sodium fluoride and copper sulphate (at Johnson Creek, a tributary of Elk Creek, Elk River, Idaho); ammonium thiocyanate (at Emida, Idaho); and sodium fluoride and Diesel oil (on the Stanislaus National Forest, California.)

A Pulaski and a pair of long-handled pruning shears were used as cutting tools in these experiments. The pruning shears were not sufficiently powerful to cut through the crowns of R. cereum (cf. d'Urbal, California) but, when used to decapitate R. viscosissimum, elicited much favorable comment from the eradication crew at Emida, Idaho. A special type of cutting shears known as the H. K. Porter Forester No. 2, has recently been tested at Berkeley with satisfactory results. This tool has considerably more cutting

power than the regular type of pruning shears. During the coming summer we plan to use this new tool, a brush hook, a Pulaski, and perhaps the regular long-handled pruning shears in a series of carefully planned experiments on upland Ribes. The rapid and convenient removal of the aerial plant parts is, perhaps, the most important feature of this treatment of individual bushes. In addition, dosage rate and ground area to be treated must be determined for the different Ribes species. A late season examination of the plots on Johnson Creek showed that both copper sulphate and sodium fluoride were apparently 100 percent effective on R. viscosissimum.

It is suggested that a crew working in upland type could carry one cutting tool, 10 pounds of chemical, and an extra gallon of water, without reducing its efficiency as a hand-pulling unit: and that when the crew encounters bushes which resist a reasonable attempt at hand-pulling, such bushes should be handled according to the method outlined above. The chemical treatment of these time-consuming Ribes is in line with Posey's and Wyckoff's idea of a more rapid first-time-over eradication.

The proposed method represents a departure from previous chemical work because it has as its immediate objective the eradication of single bushes rather than entire blocks of Ribes in thickly populated areas. By and large, such use of chemicals must be regarded as auxiliary rather than general.

WHITE PINE OF COLORADO AND WYOMING HAS COMMERCIAL VALUE

The white pine of Colorado and Wyoming has commercial value and nothing will take its place should it be destroyed by blister rust. This is the consensus of opinion expressed by numerous foresters to Messrs. Wyckoff and Joy during a recent trip to Denver and Fort Collins, Colorado and to Laramie, Wyoming.

Three species of white pine are found in these states; Pinus flexilis found generally over both states; P. aristata in the southern two-thirds of Colorado; and P. albicaulis in northwestern Wyoming. Ties are now being cut from all three species of pine, P. aristata ties at one time commanding a premium over Douglas fir ties. Some idea of the importance of this industry is gained from the fact that 300,000 ties per year for the past several years have been cut on two national forests in Wyoming.

Incompleted type information shows that there are about 250,000 acres of white pine type (50 percent white pine) in the Region 2 forests of Colorado and Wyoming. Joy considers it likely that between 750,000 and one million acres of white pine type can be located in these two states. All timber age classes and about twelve species of Ribes are found in this region. More definite information concerning the timber stands of these states and the value and practicability of blister rust control will be determined by Joy, assisted by Chapman, six temporary employees and four hill-climbing pickup trucks on reconnaissance work scheduled for this region during the coming field season.

RIBES ERADICATION TIMBER TYPES

W. G. Guernsey

The Inland Empire timber lands can be classified into a number of general Ribes eradication types. These types which are easily classified, due in the main to segregation by broad age classes, are reproduction, pole, and mature Ribes eradication types. There are two other classifications used to cover unnatural forest disturbances; these are burned and cut-over areas. There is still another type used--called stream type.

In reclassifying the first three types we separate them into dense and open types according to distribution, size of timber and ground cover. It is necessary to classify these types in such a way as to make them distinctive; otherwise we can never hope to arrive at any real classification which can be used successfully in the field. It would seem necessary in designating dense mature and dense pole that practically no Ribes should be present. This might be true in reproduction stands but there is bound to be Ribes present in dense reproduction because the period necessary to shade Ribes out has not been long enough. (This period is supposed to be about 35 years.)

It is also very apparent that more thought should be given to studying cut-over areas. These areas can be designated as distinct types such as clear cut, selectively cut by types or diameter class or cut and burned. These types are more or less important, according to the size and number of Ribes that occur.

All the eradication types to be used in the Inland Empire during the 1934 field season are stated in a general way in the following type definitions:

Open Reproduction (OR): Timber size. A timber stand in which trees under 4" D.B.H. predominate and trees are scattered, or in individual groups. Ground cover. Generally brush and many Ribes are present.

Dense Reproduction (DR): Timber size. A timber stand in which trees under 4" D.B.H. predominate and the trees occur in a uniform, densely populated stand. Ground cover. Brush and Ribes may be present but are suppressed with long stems and few leaves.

Open Pole (OP): Timber size. Timber stand in which trees 4" to 12" D.B.H. predominate and the trees are scattered or in individual groups. Ground cover. Generally brush and Ribes are present.

Dense Pole (DP): Timber size. A timber stand in which trees 4" to 12" D.B.H. predominate and are uniformly distributed over the area. Ground cover. Practically no brush or Ribes are present on the forest floor.

Open Mature (OM): Timber size. A timber stand in which trees over 12" D.B.H. predominate and the trees are scattered or in individual groups.

Ground cover. Brush and Ribes are usually present on the forest floor.

Dense Mature (DM): Timber size. A timber stand in which trees over 12" D.B.H. predominate and the trees are uniformly distributed over the area. Ground cover. No brush or Ribes are present on the forest floor.

Stream type:

This type, represented by moist conditions bordering streams, is characterized by the presence of considerable herbaceous growth which usually contains large numbers of Ribes. When these conditions extend away from the immediate edge of the stream and require separate working from the hillside type, the area is to be classified as stream type. When this is the case, the boundary between stream and upland types is marked by the break between the stream flat and the slope.

Cut-over (CO):

Timber. A cut-over area is represented by a stand in which all or a portion of the merchantable timber has been cut. Ground cover. Brush and Ribes are generally present, the number depending on the system of cutting. There may be some reproduction present but in too small amounts to influence the working conditions.

Brush (BR):

An area either burned over or of waste land on which reproduction has not yet occurred. Ground cover. There may be a heavy growth of Ribes and brush, depending, in large measure, on the number of times the area has been burned.

Alpine type:

This type which is typical of the country at the heads of many streams is marked by rank brush growth, slow tree growth, numerous rock crops or talus slopes, and unusually hard working conditions.

CLEARING RIBES AREAS BY BULLDOZER IN 1934

John F. Breakey

The bulldozer activities for Ribes suppression in 1934 will include the continuation of the work started in 1933 on the Coeur d' Alene National Forest and in addition a new machine for Ribes inerme eradication on the Kaniksu National Forest.

The new machine is to be equipped with 24" tracks and will be somewhat lighter in weight than the Caterpillar 50 used on the Coeur d' Alene National Forest. Some of the specifications for the new machine are: Tractor--an International Harvester Co. gasoline cruiser type, model 40 equipped with a 24" closed-grouser-track; bulldozer, an Isaacson with special frame for mounting on wide track assembly, and a brush rake built from blue prints and specifications furnished by the Division of Blister Rust Control.

The new bulldozer is lighter in weight, has greater horse-power per ton weight, and with the wide tracks will have only 4.75 pounds weight per square inch on the ground as against 7.8 pounds weight per square inch on ground for the Caterpillar 50.

Special pump guards, valve guards, and brush protectors are to be put on the machine before it is sent into the field.

On the Kaniksu National Forest it is planned to do clearing on R. inerme areas in the vicinity of the Forest Service Experiment Station East River, on Goose Creek, on Upper West Branch to Squaw Valley, and on Lambs Creek.

On the Coeur d' Alene National Forest clearing will be continued on Big Elk and on Tepee Creek to the junction of Independence Creek. The machine used last year has been overhauled and painted and is in first-class mechanical order.

The heavy rains last fall and winter may have raised havoc with some of the carefully piled windrows that were not burned last summer. Newly started grass and trees have undoubtedly suffered by the action of severe floods on the North Fork of the Coeur d' Alene River on areas cleared by bulldozer methods.

Each machine will be operated on a double shift schedule for an approximate period of four months during the season 1934. The men who worked on the bulldozer clearing last summer will be available for work this season and a good start is anticipated.

DETERMINING THE AGE OF PINE INFECTIONS

E. L. Joy

In order to determine the effectiveness of Ribes eradication in controlling white pine blister rust it is necessary to segregate the cankers of pine infection centers into two groups, namely: those that originated before and those that originated after the removal of Ribes. Obviously it is imperative that we have an accurate method of determining the exact year of origin of cankers before they can be assigned to these two groups.

From studies conducted in the coastal and interior regions of British Columbia, Lachmund has arrived at a method of determining the origin years of cankers through the pattern resulting from classification of a representative sample of cankers from an area, each according to the age of growth entered and stage of development. These studies show that cankers of the same age will, on the average, be distributed as follows:

10 percent on growth current at time of exposure

50 percent on growth one-year old at time of exposure

30 percent on growth two years old at time of exposure

8 percent on growth three years old at time of exposure

2 percent on growth more than three years old at time of exposure

From this average distribution pattern it can be seen that the year

of origin of a group of cankers of the same age would be that year in point of time next following the year whose growth supports the highese percentage of cankers. In a simple case, where only cankers of a single exposure are recorded, the year of origin would be the most recent year on whose growth cankers were found.

It has also been determined that in most cases a high percentage of the cankers will be visible in the bark during the second year after exposure. In other words, the period of incubation is approximately two years.

From canker tabulations made at Inland Empire pine infection centers it has been noted that the average distribution as determined by Lachmund does not always apply. In fact, it is quite common to find the highest percentage of one-aged cankers on growth that was two or three years old at the time of exposure. Some of these patterns are shown in the following table:

DISTRIBUTION OF INCIPIENT CANKERS TALLIED
AT INLAND EMPIRE PINE INFECTION CENTERS
(7 to 168 TREES IN EACH SAMPLE)

Years of Growth Infected	Tallied 1933					Tallied 1932		
	Snake Creek	S. Fk. Reeds Creek	Ruby Creek	Hemlock Creek	Crystal Creek	St. Maries River	Emery Creek	Quartz Creek
1931	0	0	0	0	2			
1930	51	11	5	12	47	19	0	5
1929	368	56	39	46	77	86	3	42
1928	578	25	42	44	76	91	4	181
1927	182	13	4	10	37	10	10	108
1926	18	2			1	1	3	17
1925								
1924								

Years of Growth Infected	Tallied 1931			Tallied 1930				Tallied 1929
	Snake Creek	Rhodes Creek	Deer Creek	Rhodes Creek	N. Fk. Reeds Cr.	St. Maries River	Elk Cr.	Long Meadow Creek
1929	1	1	1					
1928	12	21	22	10	0	4	56	
1927	72	79	105	73	9	20	158	19
1926	17	19	66	80	22	35	191	62
1925	2	1	6	14	1	4	46	102
1924			1	1	1		2	43
1923								19
1922								5
1920								1
1918								1

From this table it is evident that age of pine infections in the Inland Empire cannot be determined by the general use of the previously described distribution pattern. This fact has been recognized for several

years and has prompted various studies of the rust development in the Inland Empire. One of these studies is the determination of the rust incubation period. In connection with this work Chapman has spent the past three months in the Forest Pathology Laboratory of the School of Forestry, University of Idaho, studying the rate of blister rust mycelium growth in pine needles. His first report of that work is printed in this issue.

A STUDY OF THE MOVEMENT OF THE MYCELIUM OF CRONARTIUM RIBICOLA FISCHER DURING THE INCUBATION PERIOD IN PINUS MONTICOLA

C. M. Chapman

After reviewing literature on work done in relation to the incubation period of Cronartium ribicola Fischer, it is quite evident that the time range of that period is not definitely known. Furthermore, the variations in opinion are so divergent that it is not safe to accept any of the present statements as final.

The meaning of the incubation period is now well understood and specifically defined as that time from the initial infection of the needle by the sporidia germ tube until infection is clearly visible in the bark at the base of the infected needle.

The work of Clinton and McCormick (2) is quite thorough in relation to the activity of the mycelium during the incubation period. On page 455 these authors state: "The first year infection occurs from late summer to late fall through the leaves, producing at most very inconspicuous yellow spots at the point of invasion. In rare cases it may be that these spots develop more conspicuously and invasion of the stem takes place before winter sets in.

"The second year, during spring and early summer, the yellow spots on the leaves become more or less conspicuous; later there is invasion of the stem causing slight swelling and discoloration and possibly in certain cases pycnia are produced."

Lachmund (1) page 796, stated that "It is improbable that the incubation period is ever more than four years. As already shown, the incubation period for most of the cankers is between 20 and 26 months and ranges for decreasing numbers of cankers to about 38 or 39 months, with a possible maximum of about 41 months."

The study by the writer of the movement of the mycelium of blister rust during incubation in the pine is being conducted for the purpose of securing basic information necessary in the determination of the effectiveness of Ribes eradication in controlling the rust. Knowing the rust incubation period in western white pine, it will be possible to accurately determine the origin year of infection and thus know if it occurred before or after Ribes eradication.

For this study, the School of Forestry of the University of Idaho

is contributing greenhouse space, two large, modern laboratories, a well equipped dark room, and a private office. The blister rust laboratories are especially equipped to meet the needs of blister rust research workers with such items as rapid steam pressure sterilization chambers, spacious compartment electric refrigerators, thermo-controlled electric ovens, latest rotary microtone and modern microscopes.

The pine needles used in the study are from native-grown seedlings 6 to 8 years old and 6 to 18 inches high. These trees grew in a rust-free area, were potted in the field in native soil and were exposed to infected Ribes petiolare under natural field conditions from September 3 to October 11, 1933.

From November 1, 1933 to the present time, needles with spots have been plucked every ten days and fixed in formal-acetic alcohol. Several sets of the fixed needles have been prepared, embedded, sectioned, stained and mounted. The results have been exceptionally gratifying since a single mycelial thread can be followed with a remarkable degree of accuracy. Although the sections through needle spots show no hyphae extending for more than 500 microns beyond the discolored area of the needle, a definite accumulation of mycelium (mycelial body) is evident under each spot. The first invasion by hyphae of the central cylinder of the needle has been observed.

Some good photomicrographs have been taken and others will be taken from time to time in order to record the progress of the mycelium. Not enough time has elapsed nor have enough spots been examined as yet to furnish conclusive data regarding the advance of the mycelium down the needle and into the bark.

H. G. Lachmund
(1) Journ. Agri. Research Vol. 47 No. 10, Nov. 15, 1933.
Clinton & McCormick
(2) Bulletin 214, Connecticut Agri. Exp. Station 1918

MILD WINTER RESULTS IN INTERESTING PHENOLOGICAL DATA

Due to the extremely mild winter in the Inland Empire, Ribes activity started at an exceptionally early date. In the Deadman Creek drainage on the southwest slope of Mt. Spokane swollen and broken Ribes lacustre buds were noted by Joy and Nelson on February 1. On February 10, R.aureum was found in leaf about seven miles west of Spokane. One leaf measured 1-1/2 inches in width.

On March 10 aecial production was noted on Crystal Creek near Fernwood, Idaho. The aecial development was sufficiently advanced to indicate that the first aecia were showing in this area shortly after the middle of February.

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W E S T E R N B L I S T E R R U S T

N E W S L E T T E R

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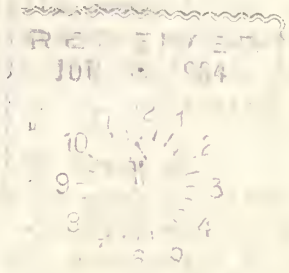

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U. S. Department of Agriculture
Bureau of Entomology
Division of Plant Disease Eradication and Control
Spokane, Washington

NEW PINE INFECTION CENTERS LOCATED IN 1934

The first center of pine infection to be located on the Kaniksu National Forest in Idaho was reported by Frank Walters at the time of going to press. About an acre of Ribes petiolare was found at the Ox Bow on Priest River about seven miles south of Priest Lake. An examination of pines nearby revealed the presence of several infected trees. More complete details concerning this infection center will be reported in a later issue of the News Letter.

On April 25 a small center of pine infection was found by a crew in the training camp on the Coeur d'Alene Forest. Three infected trees were found on the hillside above training camp at Honeysuckle Ranger Station, about 4 miles from the heavy infection on Burnt Cabin Creek. Two trees each had one incipient canker showing, the third had a fruiting trunk canker which apparently entered the trunk from a branch infection on 1925 wood.

During the latter part of April, Goodding sent in one small branch of Pinus strobus from the Mt. Hebo planting on the Siuslaw National Forest in Oregon. This small branch showed ten incipient cankers, and Goodding states that there are 10,000 similar branches (an estimate, we presume). Infection was first located in this planting by Goodding on August 19, 1931 when 12 infected pines were found in close association with R. bracteosum. The cankers were on 1927 and 1928 wood. The infections found this year were apparently due to a 1932 wave. Goodding says, "I never want to hear anyone say that P. strobus is less susceptible than anything else for I never saw such a mess as that along the stream on the south side of the Hebo planting. Entire trees have every twig and branch infected. Fortunately this does not extend any considerable distance from the stream. Control will yet save most of the pines."

Fortunately, control measures on this area are being initiated this year.

LARGE BLISTER RUST CONTROL PROGRAM SCHEDULED IN THE WEST FOR 1934.

The clarion call has sounded; the fight is on for 1934! 13,296 men have already answered or will answer the call to go forth in the Western campaign to make no Ribes grow where hundreds grew before.

7,530 of the men in 45 CCC camps financed from Emergency Conservation Funds, 1,518 men in 48 NIRA camps financed from Public Works allotment to the Division of Blister Rust Control, 4,124 men in 133 NIRA camps financed by Public Works allotments to the Forest Service, and 124 men in 4 cooperative camps financed by the State of Idaho and the Division of Blister Rust Control will be employed in Ribes eradication.

Montana will have 527 men in 17 NIRA camps; Idaho is scheduled for 3,410 men in 110 NIRA camps, 124 men in 4 cooperative NIRA camps on state lands and 7,070 men in 41 CCC camps; Washington will have 494 men in 15 NIRA camps

and 260 men in 3 CCC camps; in Oregon there will be 133 men in 5 NIRA camps and California will rate 1,078 men in 34 NIRA camps and 200 men in one CCC camp.

W. V. Benedict will have general supervision of all field work in California and in Oregon. In California the Forest Service will pay the cost of operation of all blister rust camps and will be reimbursed by a transfer of funds from the Division of Blister Rust Control for the proper share of the cost based on the proportion of federal and other lands on each operation. The blister rust personnel will assume responsibility for the technical supervision of the work.

Roy Blomstrom, assisted by Arthur London and J. Curtis Ball, will supervise 14 NIRA camps on the Stanislaus National Forest. D. R. Miller, assisted by W. B. Dunshee and Benton Howard, will supervise the operation of 12 NIRA camps on the Eldorado National Forest and T. H. Harris, assisted by Robert M. Riley and Wesley Spinney will operate 8 NIRA camps on the Plumas National Forest. F. A. Patty will supervise 1 CCC camp on Yosemite National Park and will have charge of a reconnaissance operation on the Sierra National Forest. Clyde N. Partington will be in charge of checking on all California operations.

Training schools for camp foremen and checkers were started in California on April 20 and May 1. Operation of 4 NIRA camps was started in May; the remaining camps to be placed in operation as fast as supplies and equipment can be transported to camp sites by truck and pack stock. There is a possibility that additional CCC labor may be available for eradication work at Calaveras Big Tree Park, at Skull Creek on the Stanislaus National Forest and at Crane Flat on Yosemite National Park but definite plans concerning these projects have not been formulated at the time of writing.

In Oregon, under the general supervision of W. V. Benedict, Conrad P. Wessela will have direct charge of three thirty-man Blister Rust Control NIRA camps on the Rogue River National Forest, one 15-man Forest Service NIRA camp at the Mount Hebo plantation on the Siuslaw National Forest and one 25-man Blister Rust Control NIRA camp at the Still Creek plantation on Mount Hood National Forest. Two camps operating on the Rogue River project reported a total of 147 man days of work in April. 65,797 Ribes were pulled from 204 acres, an average of 322.5 Ribes and .72 man days per acre.

In Washington sixty men from 2 CCC camps on Mount Rainier National Park will be engaged in blister rust control under the supervision of experienced Park Service foremen. One 200-man CCC camp near Sullivan Lake and 15 NIRA Camps in northeastern Washington will be handled with the Idaho Kaniksu project.

In Idaho there will be four major operations. As for the past several years the Forest Service and the Division of Blister Rust Control will each assign an operation supervisor to each project, in general, the Forest Service men being responsible for camps, supplies, and equipment and the blister rust personnel assuming responsibility for the technical supervision of the work. On the Kaniksu National Forest Frank O. Walters and A. N. Cochrell (Forest Service) assisted by L. L. White will have the supervision of 5 CCC camps, 12 NIRA camps and 4 State Cooperative NIRA camps in addition to the camps

listed for northeastern Washington; on the Coeur d'Alene National Forest W. G. Guernsey and Howard Drake (Forest Service) assisted by Neal D. Nelson and Merrill S. Oaks will operate 14 CCC camps and 30 NIRA camps; on the St. Joe National Forest and adjacent private lands near Clarkia, Idaho, H. J. Hartman and Neal Fullerton (Forest Service) assisted by S. E. McLaughlin, M. C. Riley and Donald F. Williams will supervise the work in 11 CCC camps and 36 NIRA camps; on the Clearwater National Forest and Clearwater Timber Protective Association B. A. Anderson and Paul Gerrard (Forest Service) assisted by Fred J. Heinrich will be responsible for the work of 11 CCC camps and 32 NIRA camps.

In Montana 17 NIRA camps on the Cabinet National Forest will be under the supervision of C. H. Johnson and Frank Foltz (Forest Service).

C. C. Strong will be in charge of all control work in the Inland Empire. The tremendous increase in the scope of the work has necessitated a like increase in the number of supervisory personnel. In addition to the personnel listed above the Inland Empire operations will require 31 unit supervisors, 42 CCC camp superintendents, 265 CCC camp foreman, 146 NIRA camp bosses and 12 NIRA camp foremen. AND that's not all. How about the checkers?

H. E. Swanson will be responsible for the supervision of checking on all Inland Empire operations. On the Kaniksu National Forest Harold A. Brischle will be in charge of 10 checker foremen and 30 checkers; on the Coeur d'Alene National Forest A. L. Pence, assisted by H. P. O'Donnell will be responsible for 18 checker foremen and 45 checkers; on the St. Joe operation W. F. Painter assisted by John C. Gynn will have charge of 14 checker foremen and 38 checkers; on the Clearwater operation Harry Faulkner, assisted by Hal Russell, will assume responsibility for 15 checker foremen and 39 checkers; on the Cabinet operation in Montana Kermit Miller will have direct charge of 2 checker foremen and 10 checkers. A total of 230 men makes quite a checking force!

Two training schools were held on the four Idaho operations commencing on April 23 and April 30. One training school on the Cabinet operation was started on April 23. NIRA camp bosses, CCC camp superintendents and foremen were given one week's intensive training in the duties of their respective positions and in special features of the work. Most of the ECW camps were in the field by the first part of May, the first companies arriving on April 16. The establishment of NIRA camps was commenced on April 25, the first contingent of men reporting on April 28. Most of the 146 NIRA camps were in operation by May 15. The remainder will be placed in operation as rapidly as possible during the latter part of May and early June.

SUMMARY OF RIBES ERADICATION IN THE INLAND EMPIRE, 1933

More than forty million Ribes were eradicated from 223,466 acres in the Inland Empire during the field season of 1933. 164,913 acres were worked by CCC camps and 58,553 acres by regular 25-man camps and NIRA 50-man camps. The results of Ribes eradication by types for all Inland Empire operations is shown in the following table:

RECORD OF WORK DONE BY ECW, REGULAR AND NIRA CREWS - RIBES ERADICATION
INLAND EMPIRE - 1933

Eradication Type	ECW				Regular and NIRA			Both Combined			
	Acres	Effective Man Days	Ribes	Gallons Spray	Acres	Man Days	Ribes	Acres	Man Days	Ribes	Gallons Spray
Open Rep.	26,295	33,185	10,015,228		16,330	12,574	3,273,384	37,625	45,759	13,288,612	
Dense Rep.	19,462	11,012	1,432,024		4,183	2,862	362,906	23,645	13,874	1,794,930	
Open Pole	16,412	7,833	1,241,705		10,046	4,747	1,056,177	26,458	12,580	2,297,882	
Dense Pole	2,649	1,037	122,324		2,755	948	163,143	5,404	1,985	285,467	
Open Mature	62,866	28,050	6,408,615		23,606	16,622	3,102,173	86,472	44,672	9,510,788	
Dense Mature	8,156	1,633	323,199		1,580	699	79,324	9,736	2,302	402,523	
Brush	2,928	2,417	309,743		518	1,826	612,985	3,446	4,243	922,728	
Cut-Over	8,158	5,545	1,712,853		1,249	1,503	1,150,779	9,407	7,048	2,863,632	
All Upland	146,926	90,712	21,565,691		55,267	41,751	9,800,871	202,193	132,463	31,366,562	
Stream, Hand	17,603	35,673	6,966,369		2,942	6,779	1,772,300	20,545	42,452	8,738,699	
Stream Chemical	4,997	11,066	-	295,677				4,997	11,066		295,677
Stream Slash	384	5,341	-		186	2,343		570	7,684		
Stream Machine					158	697		158	697		
All Stream	17,987	52,080	6,966,369		3,286	9,819	1,772,300	21,273	61,899	8,738,669	295,677
All Types	164,913	142,792	28,532,060		58,553	51,570	11,573,171	223,466	194,362	40,105,231	295,677

On the Coeur d'Alene National Forest 6 ECW and 25 regular 25-man camps operated for the complete field season. The regular Forest Service blister rust appropriation was sufficient to operate the regular camps only to about the end of August. The NIRA appropriation made possible the operation of these camps until October and permitted an increase in the size of camps by the addition of 350 men. ECW camps eradicated 3,081,755 Ribes from 20,288 acres with an average of 152 Ribes and 1.13 man days per acre. The regular blister rust camps worked 40,817 acres, pulling 6,679,808 bushes, an average of 164 Ribes per acre which required an average of .82 man days and cost $4.55 per acre. In addition to these hand pulling operations 158 acres on the Coeur d'Alene National Forest were cleared by the bulldozer method at an average cost of $44.57 per acre. Burning was completed on 51.25 of these 158 acres at a cost of $8.85 per acre.

On the St. Joe National Forest operation near Clarkia, Idaho 77,774 acres were worked including 75,901 acres of initial work and 1,873 acres of first mop-up work. From 14 ECW camps, 9 of which were on the National Forest land and 5 on private lands, 66,708 acres were worked. Seven 50-man NIRA camps operating for less than two months in the fall worked 11,066 acres at an average cost of $5.92 per acre. This cost included 109 acres of slashing work at $76.52 per acre.

On the Clearwater Operation 10 ECW camps were located on the Clearwater National Forest and 5 on private lands. These camps worked 77,917 acres. Five 50-man NIRA camps worked 6,512 acres at a cost of $6.73 per acre including 39 acres of slashing at $77.61 per acre.

Prior to 1933, initial Ribes eradication had been completed on 220,917 acres and second eradication on 12,856 acres in the Inland Empire. The year 1933 added 210,421 acres of initial and 13,045 acres of second eradication for a grand total of 431,338 acres of initial eradication and 25,901 acres of second eradication or first mop-up. What will be the answer at the close of 1934?

RESULTS OF RIBES ERADICATION IN OREGON, 1933

Conrad P. Wessela

During 1933 Ribes eradication was carried on in the Upper Rogue River drainage on the Rogue River National Forest. No control measures had been carried on in this region since 1925 when Ribes were eradicated from 1,834 acres. Control operations were continued in 1933 on areas adjacent to that worked initially in 1925. Some portions of the 1925 area were reworked.

All Ribes eradication was carried on in the vicinity of Woodruff Meadows and the Rogue River approximately 10 miles north of Prospect, Oregon. In the immediate vicinity of Woodruff Meadows and the Rogue River the topography is either flat or gently rolling. This area supports a mixed stand of Douglas fir, western hemlock, western white pine, white fir (Abies concolor) and Ponderosa pine, good white pine, reproduction occurs on small burns along the Rogue River. Farther west from the Rogue River the slopes are moderately steep with occasional rocky buttes occurring along the ridges. On this area Douglas fir, sugar pine, and incense cedar grow in mixed stands.

The timber on approximately 72 per cent of this area is overmature and beginning to open up, permitting young growth to become established.

The area presented a variety of working conditions. The mature timber types were easy to work. Brush concentrations encountered on the other eradication types made working difficult. Ribes klamathense occurred in dense concentrations scattered over Woodruff Meadows and on lowland stream type. The eradication of this species was difficult because of its trailing habit, long thorns and close association with brush. It presented working conditions similar to those encountered in R. inerme concentrations in Idaho forests. In some cases modified slashing was necessary, the associated brush being cut and piled to enable the men to pull the entwined bushes. The upland stream type carried medium concentrations of R. lacustre and R. sanguineum which were comparatively easy to eradicate. R. lobbii, R. cereum, R. binominatum, R. cruentum, and R. viscosissimum were also found on the area.

Two twenty-five man camps were established on August 28 and closed October 20. The results of work accomplished are shown as follows:

RIBES ERADICATION ON THE ROGUE RIVER NATIONAL FOREST, OREGON, 1933

TYPE	ACRES	MAN DAYS	TOTAL RIBES	TOTAL COST	PER ACRE		
					MAN DAYS	RIBES	COST
O. R.	406	191	25,123	$ 1,362.24	.47	62	$3.36
D. P.	202						
O. M.	4,704	512	85,311	3,651.66	.11	18	.78
D. M.	90						
MEADOW AND BRUSH	85	74	37,400	527.78	.87	440	6.21
ALL UPLAND	5,487	777	147,834	5,541.68	.14	27	1.01
STREAM	426	497	136,168	3,544.68	.94	259	6.74
ALL TYPES	6,013	1,274	284,002	9,086.36	.21	47	1.51
*STREAM	129	129	5,162	920.05	1.00	40	7.13
TOTAL	6,142	1,403	289,164	$10,006.41	.22	47	$1.63

Dense pole, dense mature and approximately 2,500 acres of open mature types were Ribes free. The acreage is included in the above summary.

* Rework of area worked initially in 1925.

A good beginning has been made toward control of the rust in this region. Blister rust infection of 1927 origin has been discovered on white pine approximately 50 miles north of the Upper Rogue River. The disease appears to be advancing toward the valuable white and sugar pine stands of this drainage. Work should be continued as rapidly as possible in order to save the pine, not only for its commercial value but also for the aesthetic value which it lends to the scenic drive to Crater Lake National Park.

RIBES ERADICATION IN CALIFORNIA, 1933

W. V. Benedict

The year 1933 marked a change in California from the experimental work of previous years to actual Ribes eradication on a practical control basis. This was brought about in part by the partial consummation of experimental work but more especially by the availability of labor in desired locations through the establishment of the CCC and by the institution of the NIRA program of the President. From 1926 to 1932, experimentation evolved flexible methods of hand eradication adapted to conditions found throughout the sugar pine belt of the Sierra Nevada. Even though the rust was not known to be present in the state, the peculiar opportunities for large-scale control offered by the CCC and NIRA projects were not to be cast aside and constituted an admirable means of beginning a program which would forestall such a state of unpreparedness as occurred in the Idaho white pine belt a few years ago. Therefore with effective methods at hand, and labor and money made available, Ribes eradication over large areas was started. A total of 5,661,189 Ribes, an average of 142 per acre, were eradicated from 39,715 acres of sugar pine type.

This Ribes eradication work was carried on by 445 men in 9 CCC camps on the Plumas, Eldorado, and Stanislaus National Forests and Yosemite National Park and by 425 men in 9 NIRA camps on the Stanislaus National Forest. The results of this work are shown in the following table:

RIBES ERADICATION IN CALIFORNIA, 1933

CLASS OF WORK		ACRES	MAN DAYS	RIBES	PER MAN DAY		PER ACRE	
					RIBES	ACRES	RIBES	COST
CCC	Initial Eradication	12,491	12,021	2,173,808	181	1.04	174	
	Reeradication	5,900	3,020	188,406	624	1.95	32	
	Total	18,391	15,041	2,362,214	157	1.22	128	*4.75
NIRA	Initial Eradication	21,324	13,071	3,298,975	252	1.63	155	3.56
Total or Average		39,715	28,112	5,661,189	202	1.41	142	

* Estimated

The average man day cost of the NIRA work amounted to $5.81. On the basis of 15,041 eight-hour man days of CCC labor, the hypothetical cost of the CCC work is $87,394.78 or $4.75 per acre. It is estimated that the production of NIRA crews, for areas averaging 17 per cent more Ribes and on which working conditions are more or less similar, is greater than CCC by 38 per cent for Ribes eradicated and 25 per cent for acreage covered and costs. This comparison is based on an 8-hour day for each. The NIRA crews actually worked an 8-hour day while the work day of CCC men averaged 5.3 hours.

During the years 1926 to 1932 inclusive initial eradication was completed on 37,214.5 acres, averaging 42.1 Ribes per acre, at a cost of $1.29 per acre and reeradication work was done on 14,375 acres, averaging 16.3 Ribes per acre, at a cost of $ .52 per acre. To date therefore 71,029.5 acres have been given initial working and reeradication has been completed on 20,275 acres. The sugar pine survey shows 3,120,137 of sugar pine type in California. Of this total, 1,419,603 acres of sugar pine type containing 11,523,132,000 board feet of sugar pine are on the Lassen, Plumas, Eldorado, Stanislaus and Sierra National Forests. It is to be hoped that the blister rust program can be continued on an enlarged scale for several years in order that the Ribes population may be reduced over most of this sugar pine type before the rust becomes established and reaches the stage of intensification and damage.

STUDIES PLANNED ON TEMPERATURE AND HUMIDITY FACTORS AS RELATED TO CANKER DEVELOPMENT

Plans have been formulated for a study of temperature and humidity factors favorable to the infection of white pine seedlings which will be exposed to infected Ribes during the field season of 1934 and planted in a protected garden. Data on pine, Ribes, Ribes infection and weather will be recorded and a thorough analysis of related factors will be made when the canker data are available.

These studies will be carried on by F.F. Staat at Newman Lake, Washington during the approximate period June 1 to September 30. During every 24-hour period (8 a.m. to 8 a.m.) five disease-free potted transplants each of Pinus monticola, P. strobus, P. lambertiana, and P. flexilis will be exposed to blister rust on infected R. lacustre. At the end of each 24-hour period the exposed set will be planted in a protected garden where the rust development can be studied several years later. Twenty unexposed pines of each species will be planted in the protected garden at the beginning of the season as checks on the disease-free condition of the stock and possible plot contamination.

The age, size, quantity and condition of foliage of each pine when exposed will be recorded and measurements taken every five days of the quantity of Ribes live stem and leafage and the amount and stage of infection on the leaves. Twice daily weather observations will provide for each exposure period the necessary data on temperature, relative humidity, precipitation, fog and dew.

Correlation of these data with data taken in Eastern studies over the past 7 years will give an early determination of temperature and humidity factors influencing pine infection in the West. The study carried on in the past of the power of R. lacustre to infect native pines on the Newman Lake plot will be supplemented by the study of the power of this species to infect potted transplants of various species. The comparative susceptibility and blister rust incubation period for transplants of various species of white pine will be determined and the distribution of cankers on various aged wood will be recorded, thus providing data on the method of determining infection ages by use of canker patterns.

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U. S. Department of Agriculture
Bureau of Entomology
Division of Plant Disease Eradication and Control
Spokane, Washington

ANOTHER PINE INFECTION CENTER LOCATED ON THE KANIKSU

A pine infection center attributable to Ribes viscosissimum was located recently on the Kaniksu National Forest on Tunnel Creek, in Section 7, Township 32 N, Range 46 E. While no canker analysis has been made, this infection apparently became established in 1931 and cankers are showing on many of the young trees.

The infection on the Kaniksu reported in the May News Letter was located in Section 1, Township 58 N., Range 5 W. Only one pine, 20 years old, was infected. Four cankers on 1923 wood were cut out and 800 Ribes petiolare bushes pulled from a small area nearby.

THE RELATION OF NEEDLE INFECTION LOCATION TO THE INCUBATION PERIOD OF BLISTER RUST

C. M. Chapman

In conducting a study of the movement of the mycelium of blister rust in the needles during the incubation period, it was necessary to record the distances from the needle bases of the initial infections on the needles. Since the location of the infection on the needle determines, to some extent, the length of the incubation period, the distribution of these infections is important.

The material used for this study consists of 33 potted native pines 6 to 8 years old, 6 to 18 inches high and bearing almost full needleage on three years of growth. These trees were exposed to infected Ribes petiolare from September 3 to October 11, 1933.

The locations of 472 representative needle infections were recorded during March, April and May, 1934. Table No. 1 shows the distribution of these infections by thirds of the needle lengths and according to the years of growth on which the needles occurred.

TABLE NO. 1

DISTRIBUTION OF NEEDLE INFECTIONS ACCORDING TO THEIR LOCATIONS ON THE NEEDLES AND YEARS OF GROWTH BEARING THE NEEDLES

Year of Growth Bearing Needles	No. Inf. Neecles Exam.	No. Infections on Infected Needles	No. Infections per Inf. Needle	Average Length Needles (mm)	No. of Infections			Percent of Infections		
					Base 1/3	Middle 1/3	Tip 1/3	Base 1/3	Middle 1/3	Tip 1/3
1933	73	89	1.2	45.6	14	51	24	15.7	57.3	27.0
1932	183	286	1.6	51.1	60	111	115	21.0	38.8	40.2
1931	59	98	1.7	58.3	29	41	28	29.6	41.8	28.6
Totals	315	473	1.5	51.2	103	203	167	21.8	42.9	35.3

Table No. 1 brings out the following points:

(1) The average length of measured needles increases with the age of the needle.

(2) The average number of infections per infected needle increases with the age of the needle.

(3) The highest percentages of infections occur on the middle one-third of 1933 and 1931 growth needles but on the tip one-third of needles produced in 1932.
(4) The lowest percentages of infections were found on the base one-third of 1933 and 1932 needles but on the tip one-third of those produced in 1931.
(5) On the average, the highest percentage of infections occur on the middle one-third and the lowest percentage on the base one-third of needles.
(6) From 60 to 73 percent (average 65) of all needle infections occur on the lower two-thirds of the needles.

To supplement these data secured from very young pines, measurements were taken of 154 representative needle infections on a 15 year old, 5 foot tree in the Crystal Creek infection area. This tree is growing within 20 feet of Ribes petiolare and was subjected to one or more exposures. Therefore the data from this tree, shown in Table No. 2, can be compared with the data in Table No. 1 only with respect to the distribution of needle infections on the needles.

TABLE NO. 2
DISTRIBUTION OF NEEDLE INFECTIONS ACCORDING TO THEIR LOCATIONS ON THE NEEDLES AND YEARS OF GROWTH BEARING THE NEEDLES

Year of Growth Bearing Needles	No. Inf. Needles Exam.	No. Infections on Infected Needles	No. Infections per Inf. Needle	Average Length Needles (mm)	No. of Infections			Percent of Infections		
					Base 1/3	Middle 1/3	Tip 1/3	Base 1/3	Middle 1/3	Tip 1/3
1931	100	112	1.1	73.2	40	43	29	35.7	38.4	25.9
1930	45	49	1.1	65.3	11	18	20	22.5	36.7	40.8
1929	9	10	1.1	49.5	0	6	4	0.0	60.0	40.0
Totals	154	171	1.1	69.5	51	67	53	29.8	39.2	31.0

The following points are derived from Table No. 2:
(1) No infections were found on needles bornein 1933 and 1932 which are the two youngest ages.
(2) The average length of measured needles decreases with the age of the needle.
(3) The average number of infections per infected needle is the same for all ages of needles.
(4) The highest percentages of infections occur on the middle one-third of 1931 and 1929 needles but on the tip one-third of those produced in 1930.
(5) The lowest percentages of infections occur on the tip one-third of 1931 needles, but on the base one-third of the 1930 and 1929 groups.
(6) On the average, the highest percentage of infections were found on the middle one-third and the lowest on the base one-third.
(7) From 59 to 74 percent (average 69) of all needle infections occur on the lower two-thirds of the needles.

Combining the data secured from these two tabulations, the following is obtained:

Average needle length	57 millimeters
Percentage of needle infections on base one-third	24 "
" " " " " middle " "	42 "
" " " " " tip " "	34 "

On April 2, 1934, which is between 5-3/4 and 7 months after exposure, the first incipient cankers were found on the potted pines. At each succeeding inspection additional cankers were recorded giving a total of 62 on May 15. Table No. 3 shows the number of cankers found at each inspection, the maximum distance out the needle to any responsible needle infection and the distribution of these cankers by year of growth infected. The distribution of the responsible needle infections by millimeter units of needle is given in Table No. 4.

TABLE NO. 3
INCIPIENT CANKERS FOUND AT EACH INSPECTION, MAXIMUM DISTANCE TO ANY RESPONSIBLE NEEDLE INFECTION AND CANKER DISTRIBUTION.

Inspection Date	No. Cankers Found	Max. Distance to Needle Infection (mm)	Year growth infected		
			1933	1932	1931
April 2	2	4		1	1
7	1	5		1	
18	5	8	2	1	2
24	11	9		8	3
28	9	10		6	3
May 6	19	16		12	7
15	15	16	2	12	1
Total	62		4	41	17

TABLE NO. 4
DISTRIBUTION, BY MILLIMETER UNITS OF NEEDLES, OF INFECTIONS RESPONSIBLE FOR INCIPIENT CANKERS

Years of growth Infected	Millimeter Units of Needles																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
1933	1		1				1	1									4
1932		2	6	7	6	5		2	4			1		1	3	1	38
1931	1		1		2	4	1	1	2	3		1			1		17
All	2	2	8	7	8	9	2	4	6	3	0	2	0	1	4	1	*59

*These infections not classified because of incomplete needle fascicle.

Since the average needle length was computed to be 57 millimeters, the base one-third would be 19 millimeters. From Table No. 3 it is seen that within 7 to 8 months after exposure incipient cankers were visible from needle infections 16 millimeters out. Thus, we can conclude that for pines 6 to 8 years old, the incubation period for the 20 to 25 percent of needle infections in the base one-third would be about 9 months. Furthermore, since the main study of mycelial development showed that this 16 millimeters of growth occurred in approximately 3-1/2 months, it is also reasonable to assume that the incubation period for the 65 to 70 percent of infections in the lower two-thirds of the needles will be approximately one year.

Since it is an accepted fact, which has been verified by the writer on the plot at Cheekye, B. C., that the incubation period for the rust in pines under 10 years of age is shorter than in older stock, the results reported in this paper cannot be applied directly to studies with the older trees. However, there is in these results some indication that at least a small percentage of the cankers on the older trees should be visible at the end of the first year after exposure.

SUMMARY OF 1934 WESTERN CONTROL OPERATIONS TO MAY 31.

Operation			Total Acres Worked	Total Man-Days	Total Ribes Pulled	Per Acre	
State	Operation	Class				Man-Days	Ribes
Montana	Cabinet	B.R.C. Nira	4,633	1,834	367,512	.40	79
		F.S. Nira	6,914	4,245	962,761	.61	139
	Total		11,547	6,079	1,330,273	.53	115
Idaho	Clearwater	B.R.C. Nira	3,719	2,054	899,015	.55	242
		F.S. Nira	10,088	6,238	1,867,804	.62	185
		E.C.W.	9,734	11,173	1,772,688	1.15	182
		Total	23,541	19,465	4,539,507	.83	193
	St. Joe	B.R.C. Nira	6,215	3,011	723,375	.48	116
		F.S. Nira	3,896	3,086	1,067,429	.79	274
		E.C.W.	15,920	12,111	2,028,659	.76	127
		Total	26,031	18,208	3,819,463	.70	147
	Coeur d'Alene	F.S. Nira	11,216	7,467	1,562,799	.67	139
		E.C.W.	5,511	12,291	1,306,713	2.23	237
		Total	16,727	19,758	2,869,512	1.18	172
	Kaniksu	F.S. Nira	13,034	4,256	695,969	.33	53
		State Coop.	3,041	794	709,329	.26	233
		E.C.W.	5,956	3,286	327,049	.55	55
		Total	22,031	8,336	1,732,347	.38	79
	Total		88,330	65,767	12,960,829	.74	147
Washington	Kaniksu	B.R.C. Nira	6,851	2,649	407,559	.39	59
		F.S. Nira	6,828	1,789	245,543	.26	36
		E.C.W.	336	591	45,811	1.76	136
	Total		14,015	5,029	698,913	.36	50
Inland Empire		B.R.C. Nira	21,418	9,548	2,397,461	.45	112
		F.S. Nira	51,976	27,081	6,402,305	.52	123
		State Coop.	3,041	794	709,329	.26	233
		E.C.W.	37,457	39,452	5,480,920	1.05	146
Total			113,892	76,875	14,990,015	.67	132
Oregon	Rogue River	B.R.C. Nira	8,747	889	292,555	.10	33
	Still Creek	B.R.C. Nira	187	223	45,230	1.19	242
	Mt. Hebo	F.S. Nira	14	48	16,744	3.43	1,196
	Total		8,948	1,160	354,529	.13	40
California	Plumas	B.R.C. and	8,165	3,915	488,584	.37	60
	Eldorado	F.S. Nira	6,597	2,211	804,138	.34	122
	Stanislaus	Combined	13,906	4,119	1,153,588	.30	83
	Total		28,668	9,345	2,446,310	.33	85
Grand Total Far West			151,508	87,380	17,790,854	.58	117

CONTROL WORK IN OREGON, MAY, 1934

Conrad P. Wessela

Rogue River Drainage. On a tract of 18,500 acres of sugar pine type in the vicinity of Prospect, Oregon, eradication work was completed during May on 1,632 acres and 7,115 acres were pronounced Ribes-free after an advance check by the checkers and careful inspection by the camp bosses and unit supervisor. 13,365 acres were advance checked.

Two small camps of 15 men each started work on May 2. One of these camps was increased to 24 on May 8 and a spike camp of 10 men established on May 10 as a supplementary unit to this same camp.

One camp in this area will finish all available tracts supporting Ribes by the latter part of June when it will be moved to the Woodruff Meadows area to complete the work started there in 1933. By July 15 the 18,500 acres of sugar pine type will be treated as effectively as possible within one year. One camp of 32 men began Ribes eradication on June 11 in the 50,000 acre stand of western white pine in the headwaters of the Rogue River. Very dense concentrations of Ribes occur on this area, some of which are quite susceptible to the rust, such as Ribes bracteosum and R. triste.

Still Creek Area, Mt. Hood National Forest. The Still Creek plantations cover approximately 900 acres on an area burned in 1910 on the Mt. Hood National Forest. Almost all the acreage represented was planted to pine in 1915, 1918 and 1919. Ribes eradication work was initiated on an experimental basis in 1927 and continued by a small crew through 1930. In 1931 a crew averaging 13 men in number for a three-month period completed eradication on 499 acres of stream type and 36 acres of open reproduction. 117.8 acres of Ribes bracteosum were sprayed with a 15 percent solution of Atlacide after associated Ribes were pulled by hand.

One camp of 25 men began work on this area this year on May 16. During May 187 acres averaging 242 Ribes per acre were worked. Eradication work on this area should be completed by July 31.

Mt. Hebo Plantation, Siuslaw National Forest. A small camp of 10 men started pulling R. bracteosum within the boundaries of the Pinus strobus plantation on Mt. Hebo on May 20. Dense concentrations of rust-infested R. bracteosum occur around the borders of the plantation. Many of the young pines are also infected with blister rust. During May only 14 acres were worked but the Ribes averaged 1,196 per acre. It is doubtful if the supply of funds allocated by the Forest Service for this job will be sufficient for the proper treatment of this area this year.

Editor: Ed Joy and his cohorts spent a day on the Mt. Hebo plantation on May 3 en route to Cheekye, B.C. Ed reported heavy pine infection along the stream forming the southern boundary of the pine plantation. Heavy pine infection does not extend for more than two chains from the stream type Ribes although scattered cankers were found on pines over one-quarter mile away.

From the few old cankers found it appears that infection originated here about 1927 or 1928. It was apparent that there was some intensification in 1931 and a very heavy wave in 1932. This is supported by the following pattern of the cankers found on one tree:

Year of Growth Infected	First Symptoms	Juv.	Pyc. Stage	Fruited Once	Fruited Twice	Total
1932	94	49				143
1931	10	350	69	2		431
1930	1	9	18		1	29
1929			2			2
1928					1	1
?						46
Total	105	408	89	2	2	652

RESULTS OF 1933 SCOUTING

The year 1933 marked a southward extension of the known limits of pine infection and an eastward extension of Ribes infection in Oregon. While there has been a marked intensification of the rust in the Inland Empire and new centers of infection have been located the known limits of infection were extended.

For the past several years no separate scouting project has been organized but scouting for the rust has been carried on by members of our personnel in connection with other work. During 1933, 13 new pine infection centers were reported, one of which originated in 1923. Prior to 1933, 77 pine infection centers had been found, 12 of which originated in 1923. The total of known centers of pine infection in the Inland Empire at the end of 1933 was 90, of which 13 originated in 1923. These infection centers were distributed as follows: Newman Lake, Washington - 1, Coeur d'Alene National Forest - 8, St. Joe National Forest - 36, private land adjacent to the St. Joe National Forest - 1, Potlatch Timber Protective Association - 16, Clearwater Timber Protective Association - 21 and Clearwater National Forest -

Some scouting was done during 1933 in the Seven Devils Mountains of west-central Idaho and around Brundage Mountain in the vicinity of McCall, Idaho but the rust was not located in this region.

In Oregon, Ribes infection was found in 1933 in 12 new locations. Three locations in Grant County in Eastern Oregon represented an eastward extension of the known infection limits. Pine infection was found at one point in Marion County and at two different locations in Lane County. The pine infection at Bohemia Mountain in southeastern Lane County represents a southerly extension of known pine infection limits and is only slightly more than 100 miles airline from the California-Oregon boundary.

PROGRESS ON THE KANIKSU

Frank O. Walters

Blister Rust work on the Kaniksu National Forest operation has been progressing satisfactorily. During the month of May 1,732,347 Ribes, an average of 50 per acre, have been eradicated from 22,031 acres. In general the going has not been difficult except for stream type, much of which has been reserved for bulldozer work. At the time of writing eight camps have finished their areas and have been moved to new locations. Several others will finish their present areas in the near future.

At present, we are moving the Washington camps into the South Fork of Granite Creek. It appears that the Idaho camps will be able to complete all the area from the Falls Ranger Station north to the forks of Granite Creek. The Washington camps are working west to the Pend Oreille River divide with the exception of the Kalispell Drainage, which is being worked only to the Washington line.

The CCC camps under the direction of Mr. Lee White are doing splendidly and are turning out far more work than we had anticipated, in spite of the fact that there has been only a small man-day turnout to date.

A PROPOSAL FOR THE EXPERIMENTAL DESTRUCTION OF RIBES INERME AND ASSOCIATED BRUSH BY THE USE OF AMMONIUM THIOCYANATE AND FIRE

G. R. Van Atta

During the past several years a conviction has been growing in the minds of many of us that the most desirable and permanently satisfactory way to solve the problem presented by brushy R. inerme stream type must involve conversion of these areas to meadow lands. It is to this end that the bulldozer development work is being dedicated. Last year slashing was tried for the first time on a large scale and the effort was attended with considerable success. Disposal of the dead brush has been accomplished by burning after completion of either bulldozer or slashing operations. After the brush was burned the ground in several areas was sown with grass seed to hasten the establishment of a firm sod.

Slashing and bulldozer work as well as the subsequent burning and seeding are still relatively new procedures in blister rust control and it is not strange that defects exist in the work that has been done by these methods so far. Progress has, however, been made and many difficult problems, especially in connection with the bulldozer work, have been met and solved. There is now good reason to believe that both slashing and bulldozer work to be followed by burning and seeding will become standard methods of attack to be used upon R. inerme growing in very brushy sites.

Undeniably the cost for these types of protective work will be high. How high the final costs will be, we do not know with certainty, nor can we determine those costs accurately until sufficient time has elapsed for sample areas to have been worked to the point that they can be placed definitely upon a permanent maintenance basis.

Certainly most areas upon which the brush has been slashed and burned will require at least one and probably two reworkings to destroy Ribes plants that have survived the first treatment as well as the new seedlings that have become established after the initial working. After this has been done and grass has taken possession of the ground an area can be regarded as upon a permanent maintenance basis. Probably the same number of reworkings will be necessary upon ground that has been initially worked with a bulldozer.

Experiments conducted by the chemical investigative unit in the use of ammonium thiocyanate during 1931, '32 and '33 have proven that it is possible to kill R. inerme with this material. They have also shown definitely how much chemical should be applied for maximum efficiency. For technical purposes that need not be reviewed at this time, most of the trials were made by applying the chemical uniformly to the whole experimental plot without regard to the location of the Ribes plants. This procedure has yielded a by-product not contemplated in the original plan.

It has been observed that ammonium thiocyanate applied at optimum dosage as an aerial spray and soil surface drench not only kills nearly all the brush including the Ribes but it also greatly reduces the number of annuals to be found upon the site the following spring. In contrast to land worked by mechanical means the number of Ribes seedlings is very small. That the soil has not been rendered sterile is indicated by the perfectly healthy appearence of such new plants as do appear. Ammonium thiocyanate applied in this manner also acts in another characteristic fashion. In the spring following treatment all dead plants regardless of kind are already well on the road to decay. The chemical causes the bark to crack and peel from the stems and roots and these parts quickly become quite weak and brittle. Much of the stem breaks and falls to the ground, forming a bed of loose dry material. These facts indicate the possibility that dense brush that has been killed by ammonium thiocyanate could be burned without piling.

The writer proposes that an adequate trial be started this year of a method of stream type sanitation to consist of complete coverage ammonium thiocyanate spray applied at optimum dosage followed next year by burning and seeding.

The advantage of this type of treatment over bulldozer work or

slashing would lie in low reworking costs due to lack of surviving root centers and scarcity of seedlings. Its disadvantage would be the high cost of initial working.

In this writer's opinion there is good reason to believe that the advantages can be made to balance the disadvantages.

The method of chemical application proposed involves the use of a small power pumper equipped with only two or three hundred feet of one-half inch hose and an orchard spray gun. The operating crew should consist of a pump tender, a sprayman, and one man to distribute chemical, lay string lines, and assist in moving equipment. Several years' experience with this type of equipment have indicated that it can be used at very low labor cost. It has been definitely proved that an adjustable orchard spray gun delivering almost the full capacity of a small gasoline driven pump produces at a considerable saving in time every bit as good results as can be obtained with the standard fine nozzles ordinarily used.

The dosage of chemical recommended for trial is 2300 pounds of 95% ammonium thiocyanate per acre. If 80% material is used this quantity should be increased to 2725 pounds per acre. In either case the volume of solution used should be 1500 gallons per acre. These dosage figures are derived from the combined results of three years' experiments with this chemical all of which results agree very closely with one another.

Application of the chemical should be made uniformly over the area treated. Leaves and stems should be wetted but the bulk of the solution should be applied to the soil surface.

The area selected for this trial should be completely covered by brush and should be directly comparable to areas worked by bulldozer and slashing. The size of the trial area should not at the most exceed ten acres.

No effort is made to deny the high cost of the chemical treatment. It can be defended, however, upon the ground that by this method first cost may prove last cost exclusive of burning, seeding and maintenance. In pleading for this experiment, attention is called to the fact that prospects of very high costs did not prevent the early trials of bulldozer methods. A belief was held that future progress might eventually lower these costs to reasonable figures. That belief is already partly, but not completely justified. While awaiting the final verdict upon bulldozer work and slashing it does not seem wise to ignore another possible method the worth of which cannot be completely evaluated in less than a three-year period.

INTERESTING CCC MEN IN BLISTER RUST CONTROL

Herbert Flodberg

Perhaps the greatest problem to the supervising personnel of the CCC camps on blister rust control is how to create and hold the interest of the men in the eradication work. This is indeed a question that is worthy of considerable consideration.

The majority of our CCC enrollees are from the eastern and central states. The West is new to them. To get an efficient eradication force it is necessary for the men to know the necessity of the work they are doing. We must get the men interested in local conditions. This, I believe, is one of the most important duties of the supervising personnel.

There are several things we can explain to the CCC enrollees which I am sure will be educational and interesting to them. Some are interested in the different species of timber in this territory; others in logging methods used, etc. It is hoped that we can work in conjunction with educational advisors in the camps to put over a program that will be beneficial to us in our field work.

Our leaders, assistant leaders and crew leaders will possibly need additional instruction in field work. We have made arrangements for them to meet with the camp superintendent, foremen, and whenever possible the unit supervisor, to discuss questions pertaining to the work. These meetings have been planned for at least twice every month and could be held as often as the supervising personnel think necessary. In this way we can give these men more definite instructions in blister rust eradication work and in crew management.

In localities where no blister rust infection is present it is difficult to impress on those not familiar with it the damage caused by the rust. The lantern slides pertaining to blister rust have been of great value to us in explaining the various things about the disease.

KANIKSU CLAIMS NEW METHOD FOR ELIMINATION OF BLISTER RUST

One of the local farmers near the Kaniksu operation describes a method of combating the disease which makes it necessary for him to keep his prize bull tied up.

It seems the boys go through the woods laying out poison red string. The blister rust bugs from the diseased trees are attracted by the pretty red string and fly over and roost on it, where they eventually absorb enough of the poison to kill them. The only objection he has is that the prize bull comes along and eats the poison string, bugs and all.

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Bureau of Entomology and Plant Quarantine
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Spokane, Washington

NEW PINE INFECTION CENTERS ON CLEARWATER PROJECT

B. A. Anderson

The worst pine infection center which has been located on the Clearwater Project up to the present time was found on Schofield Creek during the early part of June. Starting at about the center of Section 4, T. 38N., R. 6E., it extends along Schofield Creek for a distance of over a mile, into Section 5. Heavy concentrations of Ribes petiolare have served to intensify the infection. Several pines 50 to 60 feet in height were found to be literally plastered with cankers. Flags are appearing on almost all infected trees. No cankers have been found at a distance of more than two or three chains from stream type. Since the Schofield drainage contains about eleven sections of fine white pine reproduction, and all of the streams support concentrations of R. petiolare, it is highly important that this area be cleaned as soon as possible if severe damage is to be avoided.

Another pine infection center of considerable extent has been located in Section 19, T. 37N., R. 7E., at the forks of French Creek.

Two more pine infections have been found - one on Tamarack Creek in Section 9, T. 37N., R. 7E., and the other near Larson Creek at the 17-1/4 mile board on the Bungalow-Canyon trail.

Infections on Ribes have been found on almost every drainage. One fact regarding infections found on Ribes stands out - wherever R. viscosissimum and R. lacustre are found in infection areas, the R. viscosissimum is invariably found to be bearing generous quantities of uredinia and telia, and seemsto be causing the intensification of the rust rather than the R. lacustre.

THE COLORADO-WYOMING PINE-RIBES SURVEY

E. L. Joy

On June 1, Chapman and the writer, with the assistance of 7 Forestry students, started the initial work toward the development of a white pine blister rust control program in the main Rocky Mountain region. After a few preliminary steps in organization, the group moved about 50 miles northwest of Fort Collins to Pingree Park for training. There each man was schooled in pacing, use of the compass, identification of Ribes and pines, recording and compiling data and other phases of reconnaissance.

After two weeks of training, the group was moved to Rocky Mountain National Park, which is about 50 miles southwest of Fort Collins, where the white pine areas of the Park were surveyed. After the completion of this unit and with the arrival of trucks for this project, the group was organized into three crews, each with a truck and equipment. On July 2, each crew started for its assigned Forest, one going to northwestern Wyoming and two to central Colorado.

With 14 National Forests and 1 National Park containing a total of 13-1/4 million acres in Colorado and 6 National Forests, 2 National Parks and 1 Indian Reservation with a total of 9 million acres in Wyoming, a white pine-Ribes survey in these two states assumes tremendous proportions. However, by

rapid elimination of several Forests which have very little or no white pine and the further elimination of large parts of other Forests, it is the writer's estimate that this grand total of about 22 million acres will be first reduced to about 5 million acres for survey with an end result of less than 2 million acres of white-pine bearing land.

By white pine, in the Rocky Mountains of Colorado and Wyoming, we refer to Pinus albicaulis or white bark pine which is confined to northwestern Wyoming; P. flexilis or limber pine which is found throughout the forested areas of both states; and P. aristata known as bristle-cone pine, which occurs only in the southern two-thirds of Colorado. All three are high altitude species growing at elevations from 6,500 to 11,500 feet depending on the locality. On the Washakie Forest in Wyoming, white pine occurs between 6,500 and 8,000 feet while in northern Colorado the stands were found mostly above 9,000 feet. Very often the upper limit of a stand is timber line, the last quarter-mile of the slope being dotted with clumps of prostrate "shrubs".

The white pine associates vary from yellow pine at the lowest elevations and lodgepole pine at almost all elevations to Engelmann spruce, Colorado blue spruce and Alpine fir. Other associates are Douglas fir and Rocky Mountain red cedar (Juniperus scopulorum).

At least 12 species of Ribes grow in the forested areas of the two states, 9 of which have been found. In general their abundance is light to medium. R. cereum is the most widely distributed but always grows as single bushes in the uplands. R. inerme, the chief stream type species, is found in light to medium concentrations along only part of the streams. Other species found in Colorado along the streams or in moist places are R. lacustre, R. Coloradense, R. aureum and R. montigenum. In Wyoming R. petiolare and R. americanum were found in addition to the above.

In determining white pine values in these states upon which control recommendations must be based, watershed protection and aesthetic or recreational use will be of first importance in many areas with commercial timber value being secondary or even nil. Water is liquid gold in this region where so much of the valley land is irrigated and where a large population draws on the Rocky Mountain supply for the cities. Timber cover, even though it be very poor, is absolutely essential if the hordes of tourists are to continue to make this region their summer playground. These factors are ever before us as we make our survey and must be considered in the final analysis.

Commercial timber value is of importance chiefly in the southern half of Colorado and northwestern Wyoming. Ties, mine timbers, posts and lumber are the chief products with ties by far the most important. Usually the operations in the white pine are in conjunction with and secondary to the logging of lodgepole pine or spruce. Local markets consume almost all of the products.

Although it is a far cry from the protection of the Inland Empire stands of western white pine and the California sugar pine, it is the writer's belief that the protection of the Rocky Mountain stands of white pine which work

will be done eventually, will yield returns that will compare favorably with the returns from either of the above regions. This may sound exaggerated but appears reasonable when we are told by Foresters and observe for ourselves that nothing will take the place of white pine when it is removed from areas in this region. No other timber species will thrive on the white pine sites.

SUMMARY OF 1934 WESTERN CONTROL OPERATIONS TO JUNE 30.

Operation			Total Acres Worked	Total Man Days	Total Ribes Pulled	Per Acre	
State	Operation	Class				Man Days	Ribes
Montana	Cabinet	B.R.C.Nira	15,492	4,198	1,048,838	.27	68
		F.S. Nira	14,589	10,106	2,658,022	.69	182
	Total		30,081	14,304	3,706.860	.48	123
Idaho	Clearwater	B.R.C.Nira	8,344	4,924	2,226,925	.59	267
		F.S. Nira	22,156	16,830	5,441,846	.76	246
		E.C.W.	25,186	26,768	4,426,359	1.06	176
		Total	55,686	48,522	12,095,130	.87	217
	St. Joe	B.R.C.Nira	16,510	8,010	2,431,789	.49	147
		F.S. Nira	21,297	13,697	4,183,025	.64	196
		E.C.W.	29,445	27,204	5,357,461	.92	182
		Total	67,252	48,911	11,972,275	.73	178
	Coeur d'Alene	F.S. Nira	28,862	21,264	4,801,223	.74	166
		E.C.W.	14,171	28,216	3,011,517	1.99	213
		Total	43,033	49,480	7,812,740	1.15	182
	Kaniksu	F.S.Nira	32,967	10,898	2,049,769	.33	62
		State Coop.	11,528	2,969	1,135,296	.26	98
		E.C.W.	20,590	10,431	1,731,298	.51	84
		Total	65,085	24,298	4,916,363	.37	76
	Total		231,056	171,211	36,796,508	.74	159
Washington	Kaniksu	B.R.C.Nira	14,809	5,927	1,187,516	.40	80
		F.S. Nira	16,197	6,659	1,239,892	.41	77
		E.C.W.	1,192	1,671	108,214	1.40	91
		Total	32,198	14,257	2,535,622	.44	79
	Mt.Rainier N.P.	E.C.W.	164	96	8,786	.59	54
	Total		32,362	14,353	2,544,408	.44	79
Inland Empire*		B.R.C.Nira	55,155	23,059	6,895,068	.42	125
		F.S.Nira	136,068	79,454	20,373,777	.58	150
		State Coop.	11,528	2,969	1,135,296	.26	98
		E.C.W.	90,584	94,290	14,634,849	1.04	162
	Total		293,335	199,772	43,038,990	.68	147
Oregon	Rogue River	B.R.C.Nira	14,848	2,136	679,427	.14	46
	Still Creek	B.R.C.Nira	463	631	136,600	1.36	295
	Mt.Hebo	F.S.Nira	568	199	68,336	.35	120
	Total		15,879	2,966	884,363	.19	56
California	Plumas	B.R.C.and	20,873	8,782	1,790,683	.42	86
	Eldorado	F.S.Nira	23,885	7,249	2,493,994	.30	104
	Stanislaus	Combined	38,842	10,098	2,845,785	.26	73
	Total		83,600	26,129	7,130,462	.31	85
Grand Total Far West			392,978	228,963	51,062,601	.58	130

*Includes Montana, Idaho, and the Kaniksu Operation of Washington.

THE 1934 BLISTER RUST CONTROL PROGRAM IN CALIFORNIA

W. V. Benedict

For 1934 both the Forest Service and the Division of Plant Disease Eradication and Control were each allotted funds from the PWA for the purpose of forwarding blister rust control work in the sugar pine types of California. Funds of the Forest Service were primarily intended for use on National Forest lands and those of the Division for use on state and private lands. Because of the general intermingling of Government and private holdings in the sugar pine belt, it would be exceedingly difficult to independently operate camps. Accordingly, in order to build up a coordinated control program in this region the funds of both organizations were pooled, all disbursements being made by the Forest Service.

The "modus operandi" of this joint program is in general for the Forest Service to assume responsibility for establishing and maintaining the service of supply and the Blister Rust forces to administer the technical phases of the work in the field. The organization and management of camps is handled by the Blister Rust overhead in accordance with plans jointly approved by representatives of both cooperators.

Areas selected for control treatment under this program were chosen after full consideration had been given present and prospective pine values, timber management plans and present and probable ultimate land tenure. The policy adopted was to start work in the most valuable sugar pine types first and as the work progresses to work from these centers into pine areas of lower priority.

The ratio of Federal to state and private land treated is roughly governed by the ratio of Forest Service to Division of Plant Disease Eradication and Control funds available for control work, 54 percent of the joint Blister Rust fund being for work on Federal lands.

This cooperative program has now been in operation for two months and judging from progress being made in the field and the cooperative assistance given by forest officers with whom the project contacts, it is turning out to be a most simple and satisfactory arrangement for effectively handling the joint blister rust allotments.

To express the set-up of the work in another way, blister rust work is handled on the forests concerned as another forest activity, the special technical features of which are administered by the blister rust staff who work in close harmony with the Forest Service personnel.

The control project this season consists of three operations of approximately equal size on the Plumas, Eldorado and Stanislaus National Forests, respectively. A total of 1,100 men, divided into 34 camps, are employed on Ribes eradication work. According to preseason estimates, the above operations were scheduled to cover, at the termination of an 80-day work season (ending at approximately September 1) 149,172 acres of sugar pine timber.

At the end of June, after camps had been in operation for approximately one and one-half months, or somewhat less than half of the budgeted work season, 83,600 acres or 56 percent of the estimated area had been completed. On June 30, 7,130,462 Ribes (an average of 85 per acre) had been eradicated.

In addition to the seven odd million Ribes eradicated at the end of June, some 600 rattlesnakes were killed by eradication crews. One camp on the Eldorado Forest has a trophy board on which is placed, with appropriate ceremony and blue ribbon, the rattles of each snake destroyed. Under each rattle appears the name of the executioner.

Upon questioning Blomstrom's clerk as to what his chief duties are, I received this reply: "Well, I hired out as a clerk but it appears that the chief qualification of Blomstrom's clerical assistant is to be adept at grave digging. To date I have dragged in and buried nine bears and one horse."

GOODDING WRITES FROM ARIZONA

Dear Wyckoff:

Since arriving my nose has been to the grindstone much of the time for lack of transportation in the field. A grindstone for me is office work. I have however taken a few trips of short duration. Last Sunday, a week past, T. D. Mallory, one of our former black currant eradicators, who is now working for the Carnegie people at the Desert Botanical Laboratory, took me on a trip to the top of the Catalina Mountains. You and others in the blister rust office may be surprised to know that the region resembles strikingly parts of Idaho and of Oregon immediately east of the crest of the Cascades. Pinus strobiformis is a beautiful tree much like P. monticola in appearance when it is in a favorable site. Much of the area we visited has been carefully protected from fire now for years and the reproduction of P. strobiformis is far in excess of other species in many places and resembles many sites in the Rogue country. Let me recall for you that P. strobiformis is one of the leading commercial tree species of northern Mexico. In Arizona it is of little importance being on the fringe of its range and comparatively scarce. Gooseberry, Ribes pinetorum, is abundant in close proximity and, Shades of Hades, if I didn't find myself looking for blister rust! To show you that conditions are not so different from those in Oregon, let me tell you that I found our old friend Atropellis pinicola which is so common in Washington and Oregon on P. monticola. Extreme damage is done to both P. strobiformis and P. ponderosa by two of the false mistletoes. These are very bad actors.

Mr. Crider and I took a trip to Shiprock, N. M. We routed our course by Prescott where, you remember, we first found Pinyon blister rust in Arizona; Jerome, where you can throw your garbage out of your front door on to the roof of your neighbor's house; Oak Creek Canon, the land of the handsome Arizona Cypress; Winslow, the place where all Christians swear; Holbrook, now a thriving town, but a place where ever in my memory people tied their teams to a big cottonwood in the middle of town while shopping; Gallup, a thriving coal town; and finally, after a very monotonous ride across a barren desert dotted with Nevajo hogans and small flocks of goats and sheep, Shiprock. Here the government contemplates doing great things for the Indians. All over

the desert water holes for stock are being established, wells are being dug, and where streams exist irrigation canals are being dug. There are great possibilities for the land. Into this land much of our erosion control effort must be spent. Fundamentally the problem is one of controlling grazing and reestablishing vegetation where the ground cover has been wholly or in part destroyed. Not only is this to save to the Indians their lands and homes but also to prevent the rapid accumulation of silt in the new Boulder Dam. Our return was by Springerville, the Waste Mountains, Globe and Superior. We didn't see a white pine en route. The only diseased specimen I collected was a smut on Indian Rice grass.

Trusting that I may be remembered to the Blister Rust clan, I am

Yours very truly,

Leslie N. Goodding

BLISTER RUST CONTROL WORK ON THE PLUMAS NATIONAL FOREST

T. H. Harris

On May 8th the training school for the supervisory personnel of the Plumas Blister Rust Control camps closed its tent flaps, its members eagerly taking possession of their respective camp areas and organizing camp construction. Their efforts since that time and up to July 14th have resulted in the eradication of 2,578,077 Ribes from 24,945 acres of Plumas topography, notoriously steep and brushy.

The work is handled from eight camps varying from 35 to 65 men each with only one camp of less than 40 men. Although 30-man camps was the size originally decided upon, the scarcity of water in the country forced the doublin of units and the increased use of truck transportation. Long truck hauls are frequent and make the day a long one for the men.

In the construction of some of the camps, considerable clearing and fireproofing were necessary and legitimate since it was not contemplated that any of the camps, with one exception, would be moved. The cook houses are floored and screened, and consist of tents supported on a simple framework. The screening excludes flies and permits the tent sides to be rolled up allowing good ventilation. The showers are handled by an ice-can stove fitted with coils, a tank boiler, and the regular shower-head arrangement. In the larger camps the meat safe is made large enough to accommodate a meat block so that the cook can cut up his meat inside. Simple fly-proof vaults are used in the latrines.

Labor has not been a bad problem, although for a time crew leader material was at a premium. Plumas County has furnished all the laborers through the National Reemployment Service with headquarters at Quincy. Turnover is about 13 percent. Indians from Indian Valley have proved to be good workers, particularly adept at finding Ribes.

All the camps are furnished with telephones which not only make our organization more valuable to the Forest Service fire-fighting force, but also greatly increase the ease of administering our own work.

Eradication problems at practically all of the camps have been difficult from the standpoint of long travel time for crews, dense manzanita-ceanothus brush, and steep, broken topography. Two camps have worked nearly 100 percent cut-over in parts of which the Ribes have run as high as 1,500 per acre. In general the individual Ribes on the Plumas are larger, more deeply rooted bushes than those found in some other parts of the Sierra Nevada.

EDUCATIONAL WORK

The blister rust slides have been kept pretty well warmed up during the past three months in spreading the gospel of blister rust control.

The slides were shown at each of the nine training schools for ECW camp superintendents and foremen and NIRA camp bosses held in the Inland Empire from April 23 to May 3. The talk was given by C. H. Johnson and C. C. Strong at the training school on the Cabinet, the other eight were given by the educational project leader. A set of slides was also sent to Benedict for use in the California training schools.

Blister Rust talks illustrated with lantern slides have been given in thirty CCC camps engaged in blister rust control on the Kaniksu, Coeur d' Alene, and St. Joe operations. On July 23 a start was made on the schedule for these talks at the CCC camps on the Clearwater operation. This program has been successful in giving the CCC enrollees a better conception of the importance of blister rust control and the need for an efficient job of Ribes eradication. The program was made possible through the courtesy of the Forest Service in lending the necessary electrical equipment for this work. Ten of the talks were given by the educational project leader; the rest by operation and unit supervisors on the various operations.

On June 15 an illustrated talk was given to the West Deep Creek Grange. About 125 were present and appeared quite interested in the story of blister rust and its control. On June 21 the slides were shown to the Gyro Club in Spokane. The forty young men present were keenly interested in what was behind this blister rust of which so much has been said and written during the past year or two. This lecture elicited many intelligent questions concerning fundamental aspects of the whole problem. On June 29 a talk was given to a joint meeting of the Hoo Hoo Club and the Military Affairs Committee of the Spokane Chamber of Commerce.

On June 11-12 the Coeur d'Alene, Potlatch and Clearwater Timber Protective Associations and the North Idaho Forestry Association met at Pierce, Idaho. A tent was set up for a blister rust exhibit comprising infected trees from several infection centers in the Clearwater region, photographs showing various phases of the disease and control work, maps and statistics concerning white pine and a display of equipment. This was a very creditable demonstration arranged by Jack Foster, assisted by Andy O'Brien, Unit Supervisors on the Clear water operation. Signs and legends by Karl Bachman and Raymond Amey showed the expenditure of a good deal of time and effort. A supplementary table was given to a display of forest scenes painted on fungi by Karl Bachman. On the evening of June 11 Mr. Wyckoff talked on blister rust. As a supplement to this talk the slides were shown and explained by the educational project leader.

RIBES PETIOLARE "KILL" BY SEEPAGE

Ed. Rule

The value of a heavy application of chemical to the lower stem and crown roots of R. petiolare, previously stressed in all spraying instructions, accidentally received added confirmation at B.R.C. camp 52 of the Clearwater project.

A two-acre massed growth of mature "Pet" was being sprayed under swamp conditions; i.e., the drainage of this area was a slow but consistent run, or oozing. Spraying operations were commenced in lanes running at right angles to the drainage at its upper end; and owing to the fact that the Ribes roots were almost completely covered by mud or water, the lower stems were especially drenched with chemical.

On the third day it was noticed that a patch of "Pet" a chain lower down on the drainage than any sprayed area, and comprising approximately one-half square chain, had in some manner received at least an eighty percent "kill." After ascertaining that no accidental drip from spray nozzles had effected this phenomenon, we decided that this solid patch of "Pet" had been 80% killed by seepage from the sprayed area above. This was verified a few days later when another patch on the opposite side of the swamp showed the same results after the area above it had been sprayed.

The above would surely indicate beyond all doubt that R. petiolare is highly susceptible to "kill" through heavy crown-root spraying.

I T H A P P E N E D I N C O L O R A D O

(From a letter written by a
Colorado reconnaissance man)

"Today was very rough. The scenery stands on end without pretense. I walked my legs off and even yet my 'dogs are barking.' Had sort of a narrow escape today. I intended trying to go down from Thunderbolt Peak (12,000 ft.) through a sort of little 'ravine' chock full of snow and forming the topmost part of some unnamed glacier which had cut almost a perpendicular wall 1,000 feet high at the topmost part of its cirque. The upper part of this very, very steep little gully through which I intended going down had a great boulder, about 15 feet in diameter, blocking its upper end and resting upon a little stone over which I must have crawled in getting down to the gully.

"Well, I looked at that little stone and upon a freakish impulse decided to drop another stone upon it to see if it moved. I picked up a stone, dropped it, saw the other little stone jar loose upon the impact - and then felt this giant boulder upon which I was standing start slowly turning. I made one of the wildest, grabbiest leaps I've ever made and succeeded in reaching solid ground just as the great boulder and a dozen little ones of 500 pounds or so slid with an awful banging, thundering roar down that gully, sweeping snow-field and ice and rocky debris before it. The large boulder, with a roar that seemed deafening to me, struck a jagged cliff by the side of the gully, and

with a growl which seemed to come from the very depth of the mountain, a great piece of that cliff, with the slowness of enormous masses, broke off and fell with tremendous, awe-inspiring power to join the jumble and turmoil in the gully below.

"A brownish stream of mixed rock and snow 'flowed', with the action of thick cream, down the gully and onto the glacier, while the sound of the great mass falling boomed and clapped back and forth between the peaks with the roar of thunder.

"I sat down upon the ground and started shaking. For untold centuries that little stone had held up the enormously large one, forming almost an inescapable deadfall for any living creature touching the 'trigger.' I almost tried to crawl over it - but I sprang the trap without dying! Almost, I believe in a guardian angel!"

CHEMICAL TREATMENT OF DECAPITATED RIBES

A method of decapitating Ribes, especially R. viscosissimum, and the treating of the exposed crown surface with a small quantity of chemical has been developed by the chemical investigative unit.

This method was given a personal demonstration by Offord and Swanson on the four major operations in Idaho. In so far as possible the method was shown to the operation supervisors and to some of the crews on each forest. The demonstrators reported gratifying cooperation from the field men in giving the method a practical test.

The purpose of the test is to learn the practical significance of the method and to obtain an expression from crew leaders and crewmen as to the time-saving and labor-saving features of the method when used on: (a) very large bushes, (b) bushes rooted under a tree or a windfall, and (c) bushes which tend to break off at the crown. As an auxiliary method to hand pulling, this treatment with chemical of decapitated Ribes shows much promise for an extensive use on such bushes.

There is also the possibility of its usefulness as a strictly chemical method on occasional areas of heavy Ribes population.

In demonstrating the method, two ounces of chemical were applied to each decapitated bush. The chemical investigative unit is experimenting further with various dry chemicals before recommending a certain chemical for the work. Thus far there are several which have been tested which might be used.

The method is relatively simple and is used only on bushes which can not be readily pulled by one man. Bushes are cut well into crown tissue, preferably below the crown. The Pulaski is probably the most convenient tool for this operation. The exposed crown surface is scarified by rubbing a caulked or hobnailed shoe over it, especially if the cut is made through the upper part of the crown. Then a two-ounce charge of dry chemical is applied to contact as much of the crown as possible. The crown and chemical are left exposed and no dirt is thrown over them.

It is possible for a crewman to carry a sufficient number of two-ounce packages of chemical to treat the bushes requiring treatment which he will encounter in the course of a normal day's work. On some areas, where the method may have a more extensive use, it will probably be necessary to carry a larger supply into the field and have it on hand where a man can replenish his supply as needed. There are various ways in which the problem of carrying the chemical conveniently or having it available for use can be met.

While making the demonstrations and contacting various crews, it appeared that this method may have a more extensive use than was originally expected. Results of these field tests will be reported in a later issue of the News Letter.

NOTES

On July 8, Dr. Rexford A. Tugwell, Under-Secretary of Agriculture, Mr. Lee A. Strong, Chief of the Bureau of Entomology and Plant Quarantine, Mr. K. A. Ryerson, Chief of Bureau of Plant Industry, Messrs. Porter and Bressman of the Secretary's Office, Mr. W. C. Lowdermilk, in charge of the National Soil Erosion Survey, Dr. J. S. Boyce of the faculty of Yale Forestry School, Major Evan W. Kelley, Regional Forester, Region One, U. S. Forest Service, and Messrs. Wyckoff and Strong of the Division of Plant Disease Eradication and Control visited the Clarkia operation to observe the present status of blister rust infection and the results of control work.

* * *

Dale Swartz hopped off in a Washington National Guard plane from Felts Field on July 16 for Sacramento, California where Miller Cowling was picked up and an average of four hours' flying time per day for four days was spent in taking oblique aerial pictures of the California control areas. 250 aerial shots were taken on the Yosemite National Park, on the Sierra, Stanislaus, Eldorado and Plumas National Forests of California and on the Rogue River National Forest in Oregon. Cowling had left Spokane on July 3 and had taken 50 pictures of the Rogue River operation in Oregon and more than 100 shots of the California control operations. Of the thirteen dozen ground pictures taken only two were failures, one of which was due to a defective film holder. Cowling and Swartz returned to Felts Field, Spokane, on July 21, riding high, wide and handsome on a tail wind.

* * *

Mr. G. H. Collingwood, Forester of the American Forestry Association, spent two days, July 22-24, on the Clearwater operation accompanied by Messrs. Wyckoff, Strong and MacLeod, in studying white pine stands, selective logging areas, pine infection centers and control work.


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